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Cleaner Production

Fifth International High-level Seminar Seoul

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Editorials

Klaus Töpfer
United Nations Under Secretary General and Executive Director, UNEP

The Fifth International High-level Seminar on Cleaner Production marked the tenth anniversary of UNEP's Cleaner Production (CP) Programme. This seminar was the occasion for a biennial review of cleaner production initiatives worldwide, and of UNEP's CP activities in particular. It also saw the launch of the International Declaration on Cleaner Production.

Ten years on, cleaner production has built a record of successes. Among these are the adoption of the cleaner production philosophy by international agencies, the development of international and regional strategies, and the establishment of over 150 National Centres for Cleaner Production. Universities now offer courses that allow students at all levels, as well as post-graduates, to study cleaner production. Many companies have implemented cleaner production measures and are making efforts to share their experiences with others in and across their industries. All these successes are the work of a large number of dedicated individuals who promote or practise cleaner production.

The state of the world's environment shows clearly, however, that despite this progress there is no room for complacency. The challenges for the future of cleaner production can only be met through innovation on the part of its promoters and practitioners alike. Cleaner production must move beyond demonstration projects to create an ongoing demand for cleaner production services that will spur continued progress and make this progress financially feasible.

UNEP is working to promote greater awareness of, and demand for, the benefits that cleaner production can bring to both business and the environment. Cleaner production is a strategy that can cut costs, identify new opportunities and reduce liabilities, bringing economic, health, safety and social (as well as environmental) benefits. This is good business language as much as good environmental language, and is a key component of responsible entrepreneurship. Nevertheless, despite its potential for economic benefits, cleaner production innovation has too often been stopped short by lack of financing, especially for small and medium enterprises. The problem is not a shortage of available funds, but a lack of mechanisms by which funds can be accessed and directed to appropriate initiatives. To help overcome this problem, UNEP will focus during the coming years on encouraging the financing of programmes for investment in cleaner production. It will also work to build greater understanding between the financial community and those seeking to innovate.

A key UNEP initiative for creating greater commitment to cleaner production is the International Declaration on Cleaner Production, introduced at the seminar. We believe it will gain the support of many societal leaders and generate demand for cleaner production. With the backing of these leaders, the Declaration can have a multiplier effect in attracting new partners to promote cleaner production. Technology suppliers, the financial community, and business and engineering schools can all make important contributions in this area. More attention also needs to be given to those areas of the world where there has been less progress.

The consumption side of cleaner production is another new focus for ...

"A crisis for mankind is gradually approaching, as a result of the destruction of nature under the pretext of improving the quality of life. We must understand that if we do not abstain from our arrogant belief that we can create material wealth through the conquest and domination of nature, it will no longer be possible for us to develop a prosperous civilization at all. ...to that end we must hold life more precious than anything else and gather up wisdom so that cleaner production technology and production processes that preserve nature will spread around the world. I wholeheartedly hope that all the issues discussed and policies adopted at this meeting will be translated into practical action by all nations and become a beacon of light for all mankind in the next millennium."

Kim Dae-Jung
President of the Republic of Korea

UNEP. Influencing consumption will clearly be critical if we are to achieve the goal of sustainable production *and* consumption. We do not underestimate the difficulties of meeting this challenge. It will be particularly important for us to work with the marketing and advertising sectors, in view of their great potential to influence consumers at all levels.

Economic instruments that levy charges on excessive pollution and use of resources have considerable potential to shift the focus to cleaner production. The aim of such instruments should be to make the cost of pollution greater than the cost of preventing it, thus providing a strong incentive to change. Cleaner production implicitly encourages this internalization of externalities, while allowing industry to bring its creative and financial might to bear on pollution problems.

Cleaner production strategies can contribute significantly to reaching the goals of international conventions and protocols. The Framework Convention on Climate Change (with the Kyoto Protocol and the Clean Development Mechanism), as well as the Basel Convention and the emerging Chemicals Convention, offer opportunities to establish cleaner production as the preferred strategy to reach these goals, in the same way that it already contributes to the international effort to phase out persistent organic pollutants (POPs).

This was the first cleaner production seminar to be held outside Europe, a fitting symbol of cleaner production's growing global reach. Asia has had its share of catastrophes recently – drought, flooding, forest fires. The economic crisis has cast a further cloud over the region. In such circumstances, one might expect enthusiasm for cleaner production to wane. The fact that it hasn't demonstrates that there has been a realization that cleaner production serves long-term financial and environmental goals.

The reality is that cleaner production, by encouraging wiser and more efficient use of resources, serves these goals in all regions. It addresses long-term visions and sustainable development, rather than short-term growth. There can be no sustained economic growth without wise resource management. ◆

Choi Jae-Wook
Minister of Environment of the Republic of Korea

It is an honour for the Republic of Korea to host the Fifth International High-level Seminar on Cleaner Production, especially as this closes the chapter on the first ten formative years of the UNEP Cleaner Production Programme. I would like to express my sincere gratitude to everyone who has made dedicated efforts towards achieving concrete and constructive results through their active participation in the various elements of UNEP's cleaner production activities over that period. This seminar paves the way for a new direction in the 21st century, and thus it is extremely important.

As we enter the coming millennium, the historical and cultural turning point of the century, it is opportune to look back over the past. Humankind has achieved profound advances in knowledge, science and technology, while at the same time experiencing exceptional material growth.

However, as we enjoy the benefits of social development, wealth and prosperity, we are faced with the great challenge of overcoming the worsening global environmental problems – global warming, stratospheric ozone depletion, loss of biodiversity and water pollution – which will cause irreparable damage unless all nations make a concerted effort to resolve them. As His Excellency President Kim Dae-Jung said in his opening remarks, "we are witnessing various detrimental natural disasters around the world with causes that are hidden behind our remarkable scientific and technological civilization."

I personally feel that readily recognizable environmental problems such as water pollution, increased volumes of waste, and climate change are fundamentally linked to our educational systems, our production and consumption patterns, our outlook on the world, and our value systems. Therefore, environmental problems are not problems that can be tackled by simply establishing a couple of environmental policies, but can only ultimately be solved by changing our way of thinking and our awareness of environmental problems – which will, in turn, fundamentally alter the entire social structure.

Of course the term "fundamentally alter" does not imply that we should ignore the advances of civilization or the acceleration of the economic development that has improved our standard of living. It calls for an eclectic approach. "Fundamentally alter" means that economic prosperity and environmental protection must be harmonized, thus creating what we call an "eco-revolution" through which a safe and environmentally friendly society can be realized.

We all remember that the spirit of the Rio Declaration directed us to work towards more environmentally friendly production and consumption patterns and a better lifestyle, one more closely harmonized with global environmental capacity.

I consider cleaner production as a necessary alternative strategy that promises sustainable development. It is my understanding that cleaner production achieves both economic development and environmental conservation by limiting the use of resources and energy and by preventing pollution at source, from the beginning, at the product design and production stages. This is a prudent strategy.

However, the cleaner production strategy cannot be established effectively by only a few countries. We should gather together and make concerted efforts to share and search for better ideas on a continuous basis.

In this regard, I feel that the Fifth International High-level Seminar on Cleaner Production succeeded in opening a new chapter in regard to cleaner production activities, promising a cleaner and more pleasant future for coming generations that will contribute to solving the problems of environmental deterioration which directly challenge the future of humanity. ◆

UNEP's Fifth International High-level Seminar on Cleaner Production

Presentation

This special issue of *Industry and Environment* covers the Fifth International High-level Seminar on Cleaner Production, which was held on 29 September-1 October 1998 at Phoenix Park in the Republic of Korea.

The seminar was organized by UNEP's Division of Technology, Industry and Economics and the Korea Environment Institute. It was hosted by the Government of Korea and President Kim Dae-Jung. More than 200 participants from over 50 countries – representing government, industry, research and education institutions, and NGOs – took part.

The objectives of the seminar were:

- to review and evaluate cleaner production initiatives world-wide in the 1990s, with a special focus on the last two years;
- to assess the potential for further development in cleaner production, as well as barriers and ways to overcome them;
- to exchange advice and guidance in order to encourage synergies among the various cleaner production activities underway throughout the world; and
- to introduce the UNEP International Declaration on Cleaner Production.

The highlight of the seminar was the launch of the International Declaration on Cleaner Production, which had been identified as a strategic goal at the last high-level seminar in 1996. The Declaration commits signatories to adopt a preventive strategy and environmental performance targets, and to report on their progress towards cleaner production goals. It was signed by ministers and senior government representatives from countries including China, Indonesia, Norway, the Republic of Korea, Thailand and the United Kingdom, and by major corporations and representatives of chambers of commerce.

The seminar provided an opportunity to discuss such topics as the financing of cleaner production investments, technology development and co-operation, and technology innovation in specific industry sectors – such as food, textiles and chemical industries. Sustainable consumption was also one of the important components of the discussion. Twelve parallel sessions covered the food industry, technology development and cooperation, marketing and media, small and medium-sized enterprises, regional cleaner production initiatives, cleaner production initiatives in different industrial sectors, cleaner production and environmental management systems, supply chain management, eco-design, information exchange, cleaner production financing, and the International Declaration on Cleaner Production. The parallel sessions allowed participants to exchange information and ideas in smaller, more focused settings.

The seminar concluded with recommendations for actions by UNEP, the UNIDO/UNEP National Cleaner Production Centres, and all other cleaner production stakeholders. The recommendations highlight UNEP's role in leading and coordinating the cleaner production effort.

We at UNEP hope this number of *Industry and Environment* will provide a better understanding of issues and developments in the world of cleaner production, and of its potential to contribute to both environmental protection and economic benefits.

Thank you

UNEP expresses its appreciation to the Government of the Republic of Korea for hosting the Fifth International High-level Seminar on Cleaner Production. Special thanks are given to His Excellency President Kim Dae-Jung for his welcoming introductory remarks. We would also like to express our appreciation to the Minister of Environment, the Hon. Choi Jae-Wook, the Vice-Minister of Environment, the Hon. Chung Chin-Seung, and the Deputy Minister of Commerce, Industry and Energy, the Hon. Oh Kang-Hyun.

We are deeply indebted to Dr Lee Sang-Eun and his team from the Korea Environment Institute for assisting with planning and organizing the seminar.

Thanks are also due to the governmental, business and international agency representatives who demonstrated their commitment to the cleaner production strategy by becoming the 64 inaugural signatories of the International Declaration on Cleaner Production.

The keynote speakers (Dr Gordon Forward, Mr Takashi Kiuchi and Dr Ashok Khosla) admirably fulfilled their important roles of provoking discussions and stimulating ideas admirably. To them, too, we are extremely grateful.

Finally, UNEP thanks all chairpersons, speakers, rapporteurs and participants for their valuable contributions to the seminar's success.

Cinquième séminaire international sur la production plus propre

Présentation

Ce numéro spécial de la revue *Industry and Environment* est consacré au Cinquième séminaire international sur la production plus propre qui s'est déroulé du 29 septembre au 1er octobre 1998 à Phoenix Park, en République de Corée.

Organisé par la Division Technologie, Industrie et Economie du PNUE et l'Institut coréen de l'environnement, le séminaire était l'hôte du gouvernement coréen et du président Kim Dae-Jung. Il a vu la participation de plus de 200 délégués issus d'une cinquantaine de pays et représentant les administrations publiques, les milieux de l'industrie, de la recherche et de l'enseignement.

Les objectifs étaient les suivants :

- passer en revue et évaluer les initiatives de production plus propre dans le monde au cours des années 1990, en particulier ces deux dernières années ;
- évaluer le potentiel de développement futur de la production plus propre, ainsi que les obstacles et les moyens de les surmonter ;
- échanger des avis et des conseils pour encourager les synergies entre les diverses activités de production plus propre actuellement engagées dans le monde ;
- mettre en œuvre la Déclaration internationale pour une production plus propre élaborée par le PNUE.

Le moment fort du séminaire a été le lancement de la Déclaration internationale pour une production plus propre, définie comme objectif stratégique lors du dernier séminaire en 1996. La Déclaration invite les signataires à adopter une stratégie préventive et des objectifs de performances environnementales, ainsi qu'à rendre compte régulièrement des progrès accomplis. Elle a été signée par des ministres et hauts représentants de plusieurs pays tels que la Chine, l'Indonésie, la Norvège, la République de Corée, la Thaïlande et le Royaume-Uni, ainsi que par de grandes firmes et des représentants de chambres de commerce.

Le séminaire a été l'occasion d'aborder des sujets tels que le financement des investissements dans la production plus propre, le développement et la coopération technologiques, l'innovation technologique dans certains secteurs industriels, notamment l'agroalimentaire, les textiles et les produits chimiques. Les débats ont également fait une large place à la consommation durable. Douze sessions parallèles abordaient les thèmes suivants : l'agroalimentaire, le développement et la coopération technologiques, la commercialisation et les médias, les PME, les initiatives régionales de production plus propre, les initiatives de production plus propre dans différents secteurs industriels, la production plus propre et les systèmes de management environnemental, la gestion de la chaîne d'approvisionnement, l'écodesign, les échanges d'informations, le financement de la production plus propre et la Déclaration internationale pour une production plus propre. Ces sessions ont permis aux participants d'échanger des informations et des idées dans un cadre plus restreint et plus spécialisé.

Pour clore le séminaire, le PNUE, les Centres nationaux de production plus propre créés par le PNUE et l'ONUDI, et toutes les autres parties prenantes ont formulé un certain nombre de recommandations sur les actions à mener. Celles-ci soulignent le rôle du PNUE en tant qu'instigateur et coordinateur des efforts de production plus propre.

Nous espérons que cette édition de *Industry and Environment* favorisera une meilleure compréhension des problèmes et des événements qui touchent la production plus propre, et du rôle que peut jouer le PNUE pour contribuer à la protection de l'environnement et au progrès économique.

V Seminario de Alto Nivel del PNUMA sobre Producción Más Limpia

Presentación

Esta edición especial de la revista *Industry and Environment* está consagrada al V Seminario de Alto Nivel del PNUMA sobre Producción Más Limpia, que se celebró del 29 de septiembre al 1 de octubre de 1998, en el Phoenix Park de la República de Corea.

La organización del Seminario corrió a cargo de la División de Tecnología, Industria y Economía del PNUMA y el Instituto Coreano de Medio Ambiente. Se ofició bajo los auspicios del Gobierno de Corea, cuyo anfitrión fue Su Excelencia el Presidente Kim Dae-Jung. Asistieron más de 200 personas de 50 países, en representación de instituciones gubernamentales, industriales, de investigación y educativas, además de ONG.

Los objetivos del seminario fueron los siguientes:
- revisar y evaluar las iniciativas de producción más limpia de todo el mundo durante la década de los 90, centrándose sobre todo en el último bienio;
- estudiar el potencial de desarrollo ulterior en materia de producción más limpia, así como los obstáculos a los que se enfrenta y las soluciones plausibles;
- favorecer el intercambio de asesoramiento y ayuda, para promover así la interacción entre las actividades de producción más limpia vigentes en el mundo, y
- presentar la Declaración Internacional sobre Producción Más Limpia del PNUMA.

El principal foco de interés del seminario fue el lanzamiento de la Declaración, considerada ya en el seminario de 1996 como una las metas estratégicas más importantes. Dicha Declaración implica el compromiso formal de sus signatarios a adoptar una estrategia preventiva y a fijarse una serie de objetivos en pro del entorno, además de informar puntualmente sobre sus avances en la consecución de los objetivos de producción más limpia. Lo ratificaron mediante su firma ministros y representantes gubernamentales de alto rango de países tales como China, Indonesia, Noruega, la República de Corea, Tailandia y el Reino Unido, así como grandes multinacionales y representantes de diversas cámaras de comercio.

El seminario constituyó una gran oportunidad para debatir sobre temas como la financiación de las inversiones en producción más limpia, el desarrollo y la cooperación tecnológica, y las innovaciones tecnológicas en sectores industriales específicos (como el alimentario, el textil y la industria química). Otra de las cuestiones que imperó en las conversaciones fue el consumo sostenible. Se organizaron doce sesiones paralelas, relativas a la industria alimentaria, el desarrollo y la cooperación tecnológicas, el marketing y los medios de comunicación, las pequeñas y medianas empresas, las iniciativas regionales de producción más limpia, las iniciativas en la misma materia aplicadas a distintos sectores industriales, la producción más limpia y los sistemas de gestión ambiental, la gestión de la cadena de proveedores, el diseño ecológico, el intercambio de información, la financiación de la producción más limpia y la Declaración Internacional sobre Producción Más Limpia. Las sesiones paralelas permitieron a los participantes intercambiar información y puntos de vista en un marco más reducido y específico.

Entre las conclusiones cabe mencionar las recomendaciones del PNUMA, los Centros Nacionales de Producción Más Limpia de ONUDI y el PNUMA sobre las actividades futuras, así como las de otros representantes inscritos en el programa de Producción Más Limpia. Todos subrayaron el papel fundamental que el PNUMA desempeña en la coordinación y el liderato de la labor en pro de una producción más limpia.

Todos los componentes del PNUMA confiamos en que el presente número de la revista *Industry and Environment* contribuya a dar a conocer con más nitidez el ámbito y la evolución de la producción más limpia, así como su influencia beneficiosa, tanto en los aspectos económicos como en favor de la protección del entorno.

Keynote speeches on cleaner production

Summary
More business representatives than ever before attended UNEP's Fifth International High-level Seminar on Cleaner Production. Reflecting the importance some companies now give to cleaner production, two senior business executives from successful companies based in the United States and Japan each volunteered their time to deliver a keynote speech. These were followed by a keynote speech from the representative of an Indian NGO that promotes cleaner production in small and medium-sized enterprises in that country.

Gordon Forward is Vice Chairman of the Board at **TXI (Texas Industries)**, a Fortune 500 company based in the United States. He is also a director and member of numerous boards and advisory panels and serves as chairman of the Business Council for Sustainable Development's Gulf of Mexico Chapter. Dr Forward looked at an extension of the cleaner production concept: transforming wastes that cannot be reduced within a company into by-products or raw materials for another company. TXI's Systems and Technologies for Advanced Recycling (STAR) project brought together engineers, managers and accountants from the cement, steel and auto shredding operations. They identified "product synergies" that resulted in the use of steel slag in cement production, increasing the amount of cement produced while eliminating millions of tonnes of CO_2 emissions each year. Other possible "product synergies" from waste streams produced by many different processes are also being investigated.

Recognizing the leapfrog potential of by-product synergies for industries in developing as well as developed countries, the Business Council for Sustainable Development for the Gulf of Mexico, a branch of the World Business Council, is bringing together companies from different industries at regular meetings to enable them to identify by-product synergies that will reduce their impact on the environment and improve their profitability.

Takashi "Tachi" Kiuchi, Managing Director, Corporate Communications, **Mitsubishi Electric Corporation**, Japan, is the co-founder and Chairman of **The Future 500**, a US group which strives to promote sustainable industry and sound environmental practices. He described Mitsubishi's goal of eliminating all organic chlorine compounds in production processes by the end of 1999, and its step-by-step approach to life cycle responsibility for its products, as examples of the company's commitment to cleaner production and the complementary **Natural Step** principles. Natural Step is a growing, scientifically based corporate movement that encourages step-by-step efforts towards four key principles:

1. Fossil fuels, metals and other minerals must not be extracted at a faster rate than their redeposit into the Earth;
2. Substances must not be produced faster than they can be broken down and be reintegrated into the cycles of nature;
3. The productive surfaces of nature must not be diminished in quality or quantity;
4. Basic human needs must be met with the most resource-efficient methods possible.

He stressed that UNEP initiatives are "vital to every single person on this planet," and that it is time the corporate world realizes its self-interest in being a part of the solution to environmental challenges and not part of the problem.

Ashok Khosla, President of **Development Alternatives**, India, is also Managing Trustee of **People First**, an organization dedicated to sustainable development through appropriate technologies, environmental management and participative democracy. He positioned cleaner production as a "model international activity" while stressing the need to increase efforts to tackle the sustainable consumption side of cleaner production and reach small and medium-sized enterprises, which are the backbone of most economies. In India, for example, SMEs create the greatest number of jobs. They also account for 60% of the country's production, 70% of its exports and 75% of its pollution.

Dr Khosla described several Development Alternatives activities that focus on small and tiny companies in India, introducing cleaner production practices while at the same time creating jobs. Brickmaking, for example, accounts for 23% of India's carbon emissions. Development Alternatives has developed a new brickmaking process that can reduce emissions by up to 50%. The organization is also generating jobs by introducing cleaner production systems in areas such as renewable energy, electricity generation and recycled paper. He added that cleaner production would be easier to introduce throughout industry if all financial institutions made it a criteria for business financing.

Fifth International High-level Seminar on Cleaner Production

29 September – 1 October 1998
Republic of Korea

Summary Report

Regional implementation and monitoring of cleaner production

When UNEP started the Cleaner Production Programme ten years ago, there was little awareness of cleaner production world-wide. By 1998, more than 140 cleaner production centres and activities had been identified in over 40 countries. Nevertheless, the question of how best to implement cleaner production and how to monitor real progress has become more critical than ever, as emphasized by Jacqueline Aloisi de Larderel, Director of UNEP's Division of Technology, Industry and Economics, who introduced the plenary session on "Monitoring Cleaner Production Progress World-Wide".

The purpose of this session was to review the status of cleaner production globally, provide recommendations on how to improve indicators for monitoring its progress, and provide recommendations for regional initiatives to achieve better implementation. First, though, Mrs Aloisi de Larderel reviewed the recommendations made at the Fourth High-level Seminar on Cleaner Production at Oxford in 1996. She also reviewed the progress made in acting upon them and the key challenges still to be met. Three general recommendations were to target key decision-makers, form strategic alliances and increase demand for cleaner production. Some progress has been made on all three fronts, although much clearly remains to be done.

Strategic recommendations made at Oxford, and the progress in implementing them, are as follows:

1. Produce an international protocol on cleaner production. This recommendation has been met with the launching of the Cleaner Production Declaration, which now needs to be monitored.

2. Link cleaner production to other concepts. The compatibility of cleaner production and eco-efficiency is now clearly established and elaborated on in a joint WBCSD/UNEP publication.

3. Address the consumption and product demand side of cleaner production. UNEP has launched a programme specifically addressing sustainable consumption, with a senior staff member seconded by the Dutch government.

4. Provide greater support to the meet the specific needs of small and medium-sized enterprises. Much still needs to be done in this area, but a start has been made in the form of a joint European Commission/UNEP project on information needs of SMEs and intermediaries. The Internet may provide further opportunities of improving access to those in direct contact with SMEs.

5. Link with the financial sector to foster cleaner production. This is occurring on two levels. At the organizational level, UNEP's Economics and Industry offices are being merged along with its Trade and Technology offices to form a stronger UNEP Division of Technology, Industry and Economics. At the project level, UNEP is now promoting cleaner production investment in developing countries in partnership with UNIDO, the International Financial Corporation (IFC) and other bodies.

6. Establish cleaner production indicators and sectoral benchmarks. It is too early to report much progress in this area. Some efforts are being made in different areas, e.g. in the cleaner production working groups on electroplating and textiles.

7. Facilitate greater access to cleaner production information. Publications on cleaner production are available through a web site developed by UNEP. The International Cleaner Production Information Clearinghouse (ICPIC) is evolving in the light of other information dissemination developments. Optimizing the abilities and strengths of the Cleaner Production Programme's decentralized information gathering aspects, i.e. its working groups on specific industry sectors and national cleaner production centres, is not always easy in the absence of the resources needed, although the goodwill and quality of expertise of those involved is publicly recognized. A NCPC listserver is being developed to facilitate communication between working groups, NCPCs and others.

8. Help the NCPCs become self-sufficient. UNEP is helping the NCPCs develop business plans to become financially self-sufficient in a few years time.

Six speakers, representing the Asia Pacific region, Latin America and the Caribbean, Africa, West Asia, Europe and North America, were invited to provide brief status reports on the implementation of cleaner production in their regions, touching upon the major barriers faced and suggesting ways to overcome them. They were also invited to discuss ways to foster further implementation and monitoring of cleaner production in their regions.

Asia Pacific

Charoen Bunyagidj, Vice-President and Director, Thailand Environment Institute, reviewed the implementation of cleaner production in the Asia Pacific region. A publication on the status of cleaner production in the region, stemming from the results of an extensive survey, was in the final drafting. It provided details on regional cleaner production activities, country approaches to promoting cleaner production in the region, successful cleaner production initiatives, barriers to cleaner production to be overcome, future vision, and recommendations as well as addresses, Internet resources and references.

Dr Bunyagidj noted three developments that had led, for the first time, to the emergence of the cleaner production movement in the Asia Pacific region as a cohesive, regional activity: the confluence of cleaner production and the green productivity concept; the first Asia Pacific Roundtable on Cleaner Production; and an Asia Pacific cleaner production network on the Internet (more than 150 subscribers from 30 countries used this forum on a regular basis).

While many developing countries are implementing cleaner production programmes, most are still striving to seek government policy support. This is unlike the situation in developed countries, where cleaner production has often been strengthened through the establishment of government policy instruments and institutional mechanisms. Consequently, successful cleaner production initiatives in the region include: gaining government policy support and harnessing market forces and economic instruments (e.g. tax incentive schemes for companies) for the implementation of cleaner production; country-level cleaner production roundtables (Indonesia, the Philippines); and closer integration of cleaner production and environmental management systems.

Key barriers to implementation of cleaner production in the region include:

- limited participation by industry;
- lack of legislative support (e.g. continued focus on command and control approaches, counteractive water and energy subsidies or pricing);
- lack of coordination;
- lack of supplementary training (e.g. in finance, consultancy and industry sectors).

Recommendations to help the region overcome these barriers are:

- strengthening international promotion and networking of cleaner production;
- institutionalizing legislative support for cleaner production;
- addressing supplementary training needs;
- improving regional coordination;
- improving the use of Internet technology as an eco-efficient way to access cleaner production information.

Latin America and the Caribbean

Carlos Manuel Herrera Santos, Director, Sustainable Development Direction, Ministry of Environment, Colombia, spoke as a representative of the Latin America and Caribbean region. He noted that international cooperation has been decisive in promoting cleaner production in the region. There are now more than 20 cleaner production centres. There are successful experiences and increased interest in cleaner production in most of the region's countries. Cleaner production has greater credibility now that there have been successful results from various pilot projects. This year alone has seen three international forums on cleaner production: the Latin America and the Caribbean Regional Conference on Cleaner Production in Cartagena, Colombia, in April 1998; the Conference of the Americas on Cleaner Production in Sao Paulo, Brazil, in August 1998; and the Mercosur UNIDO/UNEP NCPC Workshop in Porto Alegre, Brazil, in May 1998.

However, key barriers to the implementation of cleaner production in the region still exist. These are:

- lack of cooperation and integration between countries in the region;
- low local capacity for cleaner production, thus creating high dependency on international cooperation;
- low technical knowledge of cleaner production in productive sectors;
- low industry commitment to cleaner production.

Other barriers include a strong emphasis on end-of-pipe regulation, low enforcement capacity, low efficiency of economic instruments, lack of a regional cleaner production network, scattered and unconnected information sources, and low diffusion of cleaner production success stories.

Recommended steps forward are:

- to create national roundtables on cleaner production;
- to choose a national representative for a regional network;
- to create a regional network (so as to disseminate cleaner production as the best option in the region for sustainable development, build local capacity, and unify criteria concerning policy development and instruments for cleaner production);
- to integrate the regional network with other networks.

Africa

Cleo Migiro, Director, NCPC, Tanzania, spoke on behalf of the African region. A number of countries in the region have initiated or implemented cleaner production projects or programmes, although these are often short-lived as they are usually funded through bilateral or multilateral donors. Local ownership and longer-term sustainability still need to be developed. Some examples of cleaner production initiatives in the region are:

- the UNIDO/UNEP NCPCs in Tanzania, Tunisia and Zimbabwe;
- the ILO Norway project on Employers Organizations and Cleaner Production (Kenya, Malawi, Tanzania, Zambia and Zimbabwe);
- the Southern Africa Network for Training on the Environment (Botswana, Malawi, Mauritius, Namibia, South Africa, Tanzania, Zambia and Zimbabwe);
- the UNEP/UNDP Joint Project on Environmental Law and Institutions (Burkina Faso, Malawi, Mozambique, Sao Tome and Principe, Kenya, Tanzania and Uganda);
- the proposed regional and sub-regional centres for training and technology transfer under the Basel Convention (one each for English, French and Arabic speaking countries).

The Southern Africa Regional Conference on Africa identified several key barriers to the implementation of cleaner production in Africa, including:

- insufficient business leadership or political will to address the need for industrial sustainable development;
- general lack of appreciation within the business community of the benefits and techniques associated with cleaner production;
- lack of effective regulatory pressure and appropriate market incentives;
- shortage of capacity within the public sector to effectively administer environmental regulations;
- widespread perception that the introduction of cleaner production practices has significant cost implications;
- general resistance to changing existing management practices and production processes;
- absence of strong public pressure/adoption of cleaner production.

The sub-regional conference also identified the factors that promote cleaner production practices in the region:

- entry into African markets of international businesses that are subject to increasing pressure for improved environmental performance, and that have developed capacity for implementing cleaner production practices;
- introduction of effective directive-based (command and control) regulations in combination with co-regulatory and market-based instruments;
- increasing availability of appropriate technology;
- improved cleaner production technology within existing management tools.

West Asia

Saeed Al-Alawi, Chairman, Bahrain Society of Chemists, Bahrain, presented West Asian cleaner production initiatives. Steps have been taken to establish a regional cleaner production centre, as the Gulf countries feel they are more specialized in the petrol and chemical industries and have a common interest in specific advice regarding cleaner production in this area.

Three cleaner production workshops have been held in the region, leading to an increasing number of cleaner production related courses and trained personnel, although to date mainly in Bahrain and Yemen. The principal barrier to cleaner production in the region is the lack of legislative and financial incentives to reduce waste. While some environmental legislation exists, enforcement is weak. Recognition of industries that implement cleaner production is needed. It was felt that UNEP and governments could provide support in this direction.

Central and Eastern Europe and Newly Independent States

Pavel Kazmierczyk, Environmental Action Programme for Central and Eastern Europe, Region-

The Regional Reports panel listens to Cleo Migiro's report: (left to right) Carlos Santos, Jacqueline Aloisi de Larderel, Saeedd Al-Alawi, Pawel Kazmierczyk and Marianne Lines

al Environmental Centre, Hungary, presented cleaner production progress in Central and Eastern Europe (CEE) and the Newly Independent States (NIS) in Europe. The Environmental Action Programme (EAP) provides a framework for CEE and NIS countries to set priorities and to better coordinate national and international efforts to restore and protect the regions environment. Cleaner production became an EAP work programme priority in 1993. At a ministerial conference in 1995, a declaration was adopted calling for a work programme to promote implementation of cleaner production programmes in all CEE countries by 1998, and to foster cooperation and networking among all the stakeholders involved.

A basic capacity level needed for further dissemination of the cleaner production concept and principles throughout industry and society was felt to involve creating an active core of local cleaner production advisors and trainers, a set of cleaner production studies, demo projects and model business plans, functioning cleaner production centres, training materials in local languages, and inclusion of cleaner production principles in university course curricula. A 1997 assessment of cleaner production progress in 27 CEE and NIS countries revealed that there are four categories of countries in the region:

- countries which already have a basic capacity level (Poland, Czech Republic, Slovakia, Hungary, Lithuania, Estonia, Russian Federation);
- countries with cleaner production programmes underway but still dependent upon external support (Romania, Bulgaria, Latvia, Slovenia);
- countries where some cleaner production activities have been initiated (Croatia, Georgia, Kazakhstan, Uzbekistan);
- countries where cleaner production has yet to be implemented (Armenia, Azerbaijan, Kyrgystan, Moldova, Albania, Belarus, Bosnia-Herzegovina, FYR of Macedonia, Yugoslavia).

An important development is the recent adoption of the Policy Statement on Environmental Management in Enterprises by participating Environment Ministers of the Environment for Europe Ministerial Conference at Aarhus, Denmark, in June 1998. As a result, the OECD will focus on NIS countries while the Regional Centre for the Environment will coordinate activities in CEE countries.

One of the main barriers to more successful cleaner production progress is the lack of industry commitment. This is due to:

- limited interest among most enterprises;
- the economic situation – a focus on short-term cash flow problems;
- problems in assessing costs and benefits of cleaner production programmes;
- lack of policy framework with incentives;
- difficulty of access to finance – lending conditions and preparation capacity;
- mindset – focus on end-of-pipe measures and culture of non-compliance;
- separation of environmental management and economics and production.

However, recent developments may act as drivers in creating increased demand for cleaner production:

- increasingly tight regulations and better enforcement;
- some progress with the use of economic incentives/financing;
- requirements related to accession to the European Union;
- implementation of ISO 14000/EMAS;
- realistic resource pricing, particularly of water and energy;
- market pressure and competitiveness;
- stabilizing economic situation;
- successful activities of some CP/PP centres;
- national environmental policy developments giving priority to cleaner production and preventive environmental management.

North America

Marianne Lines, Executive Director, Canadian Centre for Pollution Prevention, provided a North American perspective through reviewing Canada's progress in implementing cleaner production. Although North America has experienced an extraordinary evolution in the shift towards pollution prevention over the last decade, there is still a long way to go before the cleaner production approach becomes the preferred and ultimately only environmental strategy.

Experience in Canada reaffirms that achieving environmental results requires a strong legislative base, on which flexible strategies can be built, and understandable polices rooted in good science. The Government of Canada has made pollution prevention its priority environmental strategy for achieving sustainable development. A number of policies guide federal, provincial and territorial pollution prevention programmes and initiatives (Canadian Environmental Protection Act, Canadian Council of Ministers of the Environment Strategy to Fulfil the National Commitment to Pollution Prevention, etc.).

Non-regulatory programmes are also proving to be effective strategies in Canada to complement regulations. One example is the Accelerated Reduction and Elimination of Toxics Programme, leading to reduced toxic emissions of 61% from base year levels, representing 21,499 tonnes of pollutants that are no longer released into the environment.

Other non-regulatory initiatives, including private sector partnerships and formal environmental agreements (memoranda of understanding), have also contributed to cleaner production progress in numerous industry sectors such as the automotive, metal finishing, and printing and graphics industries.

Training, case studies and focal points for the exchange of cleaner production information are also essential in furthering cleaner production progress. In Canada, two pollution prevention information systems are coordinating efforts to support a broad range of audiences: the Canadian Pollution Prevention Information Clearinghouse (**http://www.ec.gc.ca/ccpic**) and the Canadian Centre for Pollution Prevention (**http://www.c2p2.sarnia.com**).

Future implementation of cleaner production

"Cleaner production has not yet come of age – it has reached adolescence, and thus its most difficult years," said Brian Robinson, Chairman of the Victoria Environmental Protection Authority, Australia, in introducing the final session on the next decade for cleaner production. There is no recipe for success in getting cleaner production through the turbulent teenage years in all industry sectors or in all countries. But much has happened in the first ten years of cleaner production. A plethora of case studies and pilot programmes have demonstrated that cleaner production does work, and that it is a necessary pathway to sustainable development. The concept is recognized at the highest levels of government, many of which have integrated cleaner production into legislation and policy instruments. Important cleaner production related initiatives have been taken by major international organizations and multinational corporations.

The experience in the Australian State of Victoria indicates that the principle challenges for the next decade all deal with communication:

- finding better ways to communicate the cleaner production message;
- moving from supply-driven to demand-driven cleaner production;
- commitment to true partnerships with industry sectors, including customer-supply chains and regional areas (leading to economic demand for sustainable improvements);
- improved community participation.

UN Visions for the Future

Kenneth Ruffing, Officer-in-Charge, Division for Sustainable Development, UN-DESA, in speaking of the Commission on Sustainable Development's sustainable consumption and production work priorities (see accompanying article), saw the conclusions of the cleaner production conference as direct input to the CSD's deliberations in April 1999 and the *ad hoc* intergovernmental working group which will meet during the last week of February 1999 to prepare for the CSD's 7th session. The contribution of cleaner production will continue to influence the Commission as it assesses the impact of changing consumption and production patterns in regard to agriculture and forests in 2000, and energy and transport in 2001. Cleaner production will also be central to an evaluation of sustainable development progress at the Earth Summit planned in 2002.

Edward Clarence-Smith, Head, Cleaner Production Group, UNDIO, outlined four possible UNDIO commitments to further implementation of cleaner production:

1. increase the number of National Cleaner Production Centres by 20 to 30 over the next three years;
2. implement the Cleaner Production Declaration in all UNDIO activities and help UNEP to bring other signatories to the table;
3. make a commitment to move on to a higher level, and move beyond "doing better" to "doing something else" – for example, in UNDIO programmes with small and medium-sized enterprises;
4. foster more meaningful UNIDO cooperation with the rest of the UN system in implementing cleaner production.

Sustainable consumption and production

Kenneth G. Ruffing
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Introduction

The Division for Sustainable Development, as many of you know, is the Secretariat for the UN Commission on Sustainable Development. It is also one of nine divisions and programmes within the new Department of Economic and Social Affairs (DESA), which emerged from the merger three UN departments last January. The new department not only supports consensus policy development and building in intergovernmental bodies like the Commission on Sustainable Development (CSD). It also carries out data collection and analysis, and it provides advisory services and implements technical cooperation field projects at the request of developing countries.

During the first five years of the Commission's work to promote the implementation of Agenda 21, considerable attention has been given to the issue of changing consumption and production patterns.

Policy measures which are directed at changing consumption and production patterns can have major impacts on many of the economic, social and environmental objectives of sustainable development. Such measures are designed to focus primarily on the micro-economic determinants of the behaviour of economic agents acting as producers and consumers. Other types of policies are needed for promoting economic growth and trade, changing demographic behaviour, developing human resources and alleviating poverty. Policies in all of these areas and more need to be designed and implemented to achieve sustainable development.

In its work on sustainable development, the Commission on Sustainable Development (CSD) assigns an overriding priority to eradicating poverty and meeting basic needs. This is because only in a world in which effective action is taken to deal with basic inequalities can a consensus on cooperative international action to deal with environmental issues be maintained. Indeed, the present unequal distribution of the world's environmental space is primarily a reflection of unequal levels of development.

We have found that a focus on changing consumption and production patterns is especially useful for integrating environmental and economic factors, for focusing on the demand side as well as the supply side of the economy, and for highlighting the need for policy measures which affect the behaviour of a large number of economic agents. Measures which internalize environmental costs to the economic agents responsible for them are important for changing behaviour. But these need to be accompanied by measures which facilitate or magnify the responses of economic agents. Thus, a list of policy options might include: regulatory instruments, economic incentives and disincentives, social incentives and disincentives, facilities and infrastructure, information and education, and technology development and diffusion.

Patterns of production and consumption are driven by final demand, competition, innovation and financial flows. Final demand, in turn, is driven by the purchasing choices of individuals, businesses and public sector entities which themselves depend on such factors as basic human needs, tastes (influenced by advertising), per capita income and wealth, and relative prices. Meeting these consumption demands sets in motion a flow of materials and products, generating in the process wastes and by-products harmful to the environment and to human health.

The integrated life-cycle approach recognizes that resource production and consumption is a multi-stage process, with each stage associated with certain types of environmental degradation. An immediate corollary of this is that each stage should be regarded as an integral part of a whole

Parallel sessions

Food industry

The parallel session on the food industry was chaired by Robert Pagan of the UNEP Cleaner Production Working Group on the Food Industry, Australia, with Michael Joergensen, Technical University of Denmark, acting as rapporteur.

Mr Hikaru, General Manager, Asahi Breweries Ltd. Japan, described the environmental achievements at Asahi Breweries. Solid waste has been reduced to zero at one brewery through reuse of waste malt as cattle feed, waste yeast as an ingredient in medicine and food seasoning, wastewater sludge as organic fertilizer, label scraps as base paper for packaging boxes, and spent filtration agent for composting or as an ingredient of cement. CFCs will be substituted at one of the breweries at the end of 1998. Environmental management is being implemented: a mission statement and environmental policy have been developed, and an environmental organization has been established with a number of committees. Asahi Breweries Ltd has formulated targets for reducing CO_2 emissions through energy conservation and curtailment of CO_2 emissions. The driving force has been the need for a positive environmental image in view of consumer expectations.

Suporn Koottatep, Department of Environmental Engineering, Chiangmai University, Thailand, presented some general cleaner production measures for the food industry: reuse of organic material, product recovery, internal reuse of water, segregation of waste streams, and good housekeeping. He described some general barriers to cleaner production in the industry, such as: lack of environmental consciousness, availability of free or cheap resources, lack of enforcement of regulations, limited information transfer, use of imported equipment (making repair and optimization difficult), lack of employee training combined with a high shop floor employee turnover, and the lack of economic resources and personnel needed for actual implementation of cleaner production (a problem for SMEs in particular). Some challenges for the future are: better support for implementation of cleaner production in SMEs; nature conservation in regard to growing and harvesting of raw materials in forests; and redesign of packaging for recycling and reuse. The economic benefits have not been calculated.

The discussion showed that the causes of waste problems sometimes have to be sought outside the processing plant. For example, poor quality bottles are a major cause of breakage during filling at breweries. Depending on the type of food production, the causes of excess water usage can be lack of management and employee awareness as well as use of old equipment.

Edith G. Cabrera, Environmental Manager, San Miguel Corporation, Philippines, presented the environmental achievements of the San Miguel Corporation, the Philippines' largest food, beverage and packaging conglomerate. San Miguel's environmental management system is based on the cleaner production hierarchy, with source reduction and waste segregation the strategies at the top of the hierarchy. The organic load from chicken processing has been cut by 80%. In meat processing, water usage has been cut by 64% per day and the organic load of wastewater by 37%. In milk processing, water usage has been reduced by 60%. Effluent and treated wastewater are monitored weekly to check compliance with company standards. In order to support continuous improvement, benchmarking is carried out monthly and annually within the conglomerate.

interrelated process, with changes at one stage yielding effects at other stages. For instance, establishing manufacturers' responsibility for some aspects of disposal at the end of product life cycles may influence the design of the product and packaging material, thus integrating waste avoidance into the production process.

Elements of a policy approach to accelerate change

As an economist, I would say that unsustainable consumption and production patterns are due to the fact that environmental services are undervalued and therefore tend to be used wastefully, whether as inputs into the production process or at the end-use stage in households or by public institutions. Most environmental services are undervalued due to several types of institutional failures. Market failure is widespread because too many environmental costs are externalized; pollution in all its forms is the best example; and here government intervention in markets is of critical importance to internalize such costs. Policy failure is also widespread, for example when governments intervene in markets in ways which actually encourage unsustainable practices, such as many environmentally damaging subsidies. These can be addressed by policies which internalize external environmental costs to the economic agents responsible by removing subsidies which encourage unsustainable consumption and production practices, by creating institutional mechanisms to manage global commons, by helping the poor secure sustainable livelihoods, and generally by raising environmental consciousness.

In the Commission on Sustainable Development, changing consumption and production patterns is also one of several highly interlinked subjects including innovative financial mechanisms, the transfer of environmentally sound technologies, the use of economic instruments, and trade and sustainable development; in the end the discussion in all these areas points to the need for an internationally harmonized approach towards the internalization of environmental externalities.

CSD has repeatedly reaffirmed its commitment to the principle of common but differentiated responsibilities which recognizes, on the one hand, the need for developed countries to lead by taking effective measures for change in their own countries and, on the other hand, the benefits that accrue to all countries from establishing and monitoring more sustainable consumption and production patterns. This principle is especially important when distinguishing between policy approaches appropriate for global commons issues and those appropriate for national or local environmental issues.

CSD has also focused on the need for information for decision-making. This includes comprehensive environmental information and monitoring data which may be incorporated into environmental resource accounting and which, together with economic and social data, can be transformed into sustainable development indicators. CSD has encouraged the development of a set of SDI indicators which are now being tested in several pilot countries. The Secretariat has recently identified a supplementary set of indicators on sustainable consumption and production for which methodology sheets are being prepared.

Consumers also need more information to make environmentally sound choices; such information should cover product content, as well as environmental impacts of production, use and disposal. In that regard, in April the CSD will take up the question of revising the UN Guidelines on Consumer Protection to include sustainable consumption. Environmental audits and accounting at the enterprise level are also essential to improve environmental management and enable shareholders to hold companies responsible for their environmental performance.

Information for decision-making is essential for the necessary task of setting priorities to address the most damaging effects of unsustainable consumption and production patterns. These priorities will be different in countries at different levels of development. Developed countries have attached high priority to reducing the impact of prevailing consumption and production patterns on the global commons and on reducing waste. The most pressing environmental problems in many developing countries are those which affect human health, such as indoor burning of biomass for cooking and heating, polluted drinking water and lack of sanitation. In other countries, poor agricultural and other faulty land use practices have been responsible for a loss of soil fertility from erosion, salinization, waterlogging and desertification.

If information is one key tool for change, careful choice of policy instruments is another. Policy instruments to bring about changes in production

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During the discussion, the following topics were stressed:

- There is a need for harmonization of environmental performance indicators within the different parts of the food sector. It will probably not be possible to get the same indicators across all parts of the sectors, due to the different raw materials. Some sub-sectors calculate key indicators per litre or hectolitre and others per animal, making cross-referencing difficult. Such indicators could be used as the basis for benchmarking in some cases.
- There are different strategies for minimizing waste from push products in dairies (when changing flavours in filling processes): letting the new product push what remains of the previous product out for use as animal feed; or rinsing with water when it will be used as animal feed or with alginate solution when it will be used as a raw material for product flavouring.
- There seems to be a big gap between the implementation of cleaner production in multinational corporations and in SMEs. Multinational corporations might play a role in implementing cleaner production in SMEs. San Miguel seems to share experiences with SMEs within the framework of sector-specific groups in the Food Chamber. The example was given of a multinational corporation letting a staff member transfer cleaner production experiences. This took place, however, at the initiative of the staff member and not as part of corporate strategy. UNEP was urged to try to influence multinationals to share their experiences with SMEs. Several countries have launched cleaner production programmes focusing especially on SMEs, and consequently there are already a number of success stories from SMEs within the Asian food sector.

It is important to be aware of the possible impact of cleaner production initiatives on food quality. For example, this limits water recycling possibilities in the meat industry. At San Miguel all cleaner production initiatives have to be assessed before implementation, including the impact on the product quality.

There is a need for collection and analysis of experiences with the process of changing to cleaner production: how is implementation ensured through internal capacity building, external relations with suppliers and customers, enforcement by authorities, etc.? Very often, the only information released is the overall achievement.

The potential and limitations of a zero emission strategy as a cleaner production strategy need to be explored.

Organic farming has potential as a cleaner production strategy in agriculture.

At the end of the session, the brochure of the UNEP Food Industry Working Group was disseminated and participants were encouraged to link up with the working group and form an active network cell. The concept was received very well by those attending, and we anticipate active involvement in the future.

Technology development and cooperation for cleaner production

The parallel session on technology development and cooperation for cleaner production was chaired by K. Han, Textile and Cleaner Production R&D Centre, Korea Institute of Industrial Technology, Korea, and reported by V. Macia, Centre for Cleaner Production Initiatives, Department of the Environment, Catatonia, Spain.

The purpose of this session was to look at ways to overcome barriers and identify mechanisms and activities to foster the shift from predominant end-of-pipe or pollution control technologies to preventive, cleaner production techniques. Discussions focused on providing answers to several key questions as follows.

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and consumption patterns include legislation and standards (command-and-control measures), fiscal and pricing policies (economic instruments), education, awareness campaigns and voluntary agreements (social instruments), public expenditures on complementary facilities and infrastructure, and technology policies. Often these measures are pursued together to achieve enhanced effectiveness. Command-and-control measures have been the mainstay of environmental regulation. Although they succeed in internalizing costs by mandating the achievement of certain targets or even certain production methods, the costs are not transparent, there is usually little scope for flexible response by industry, and there is a heavy burden of inspections to ensure compliance. Consequently, attention has been shifting to social and economic instruments.

The UNCED process provided strong momentum for the use of social instruments. These include information for consumers and communities, such as eco-labelling schemes. They also include voluntary agreements negotiated by governments with industry and other major stakeholders to meet specific environmental targets, an approach which has been widely applied in Norway and the Netherlands.

An important feature of economic instruments lies in their incentive effects on behavioural changes by both manufacturers and consumers. For instance, emission charges create powerful incentives to reduce environmental degradation since reductions in charges are commensurate with reductions in pollutants. This cost factor (as is the case with tradeable permits) also stimulates manufacturers to search for cleaner technologies, thereby contributing to long-run changes in production processes. Indeed, it has been generally established that the incentives effects that internalizing externalities have on behavioural changes by manufacturers are positive.[1] As for consumers, deposit-refund systems are clearly aimed at changing their consumption habits.

Basically, economic instruments include the following main types:

- charges/taxes on emissions (subdivided into air, noise, soil, waste and water);
- charges/taxes on products;
- deposit-refund systems;
- tradeable permits.

As the discussion on the need for internalization of externalities above suggests, most of these instruments are intended to correct for market failures. However, in a considerable number of cases charges are related to services rendered, especially in the case of the collection and disposal of municipal waste. In an increasing number of developing countries and economies in transition, economic instruments are also being used to generate resources to fund national environmental protection programmes.[2]

Of the main types of economic instruments, only tradeable permits are directly related to the creation of a market where emissions permits could be traded between interested sellers and buyers. Successful experiences with tradeable permits, in the relatively few cases where they have been introduced, also point to the importance of the simultaneous use of other instruments. In the case of tradeable permits, command-and-control measures are also necessary since regulatory authorities have to pre-define the emissions ceilings. Thinking about how economic instruments work offers important insights relevant to the dissemination of cleaner production.

Whether or not an economic instrument by itself will be effective depends on a number of things. Economic analysis suggests that the impact of imposing a tax on an environmentally important input in a production process will be greater when:

1. it is easy to find a substitute for the taxed input (high elasticity of substitution);
2. the substitute input can be obtained without its cost rapidly increasing (high elasticity of supply);
3. demand for the final product is highly sensitive to increases in its price, so that the tax cannot easily be shifted to the consumer (high price-elasticity of demand);
4. the taxed input represents a relatively large share of total costs.

The first consideration points to the need for speeding up the process of technological innovation and diffusion (a key role for cleaner production centres), which will be at least partially induced by cost internalization measures. The second consideration points to the need for government provision of infrastructure, or for subsidization of its provision by the private sector. For example, transportation patterns will only change slowly in response, say, to an increase in gasoline taxes if a public transportation system cannot expand service rapidly. Similarly, use of electric vehicles cannot increase much without a

1. What is the role of governments in the development of new technologies for cleaner production?
Governments' role is crucial to provide increased support to the implementation of new cleaner production technologies by industry, mainly due to the risk involved. Interministerial collaboration is needed not only in long-term planning, but in short-term implementation of such new cleaner production technologies.

2. What is the role of industries and technology owners?
Industries and sectors need to analyse the economic feasibility and profitability of new cleaner production technologies (on a long-term basis) and to work with governments to create new markets for such technologies, building capacity and spreading these technologies, complemented by the regulatory systems needed to internalize externalities.

3. What is the role of new technology developers and suppliers?
New technology developers and suppliers need to adapt their efforts to the scenarios designed by prospective tools and by the changes in consumption patterns.

4. How should these new technologies be evaluated? By whom? Under which criteria? What is the role of UNEP?
All the stakeholders need to be involved in evaluation, and specific tools need to be developed for different or specific uses of such technologies. UNEP's EnTa is considered an appropriate instrument. The preparation of specific technological test protocols by UNEP would be an interesting objective.

5. What should UNEP do to foster development of cleaner production technologies?
UNEP should use existing institutions within the UN (CSD, UNIDO, etc.) as well as the different centres and organizations (e.g. WBCSD) working on cleaner production to provide a broad picture for cleaner production opportunities.

6. How can governments help to initiate the establishment of a cleaner production technology industry?
Governments should provide incentives (fiscal, financial, legal, etc.) and institutional support (i.e. facilitating BAT demonstration programmes).

7. What are the national policy frameworks for technology cooperation on cleaner production?
UNEP and other similar institutions can help this process, facilitating the steps of evaluation and transfer of new cleaner production technologies to developing countries.

Final recommendations:
- Future actions to promote cleaner production cannot rely only on governmental regulations. Voluntary agreements (involving suppliers, customers) must be promoted.
- The role of national cleaner production centres and similar institutions must be promoted.
- Bilateral and multilateral agreements to facilitate technology transfer must be encouraged, supported and promoted.

Marketing and media

The parallel session on the role of marketing and media: building a bridge between cleaner production and sustainable consumption was chaired by Erik Brandsma, UN/DESA, with Nick Robins, IIED, UK, as rapporteur.

Marketing and media can play an important role in bridging cleaner production and sustainable

network of recharging stations. The third consideration suggests that when consumers are highly sensitive to price, they will reduce their consumption of a product whose price increases, thus indirectly reducing its environmental impact – even if producers are slow to adjust by altering their production methods. Finally, if a taxed item, such as an input in a production process, represents only a small proportion of total costs, a small tax will have little effect because the overall impact on profitability will be small. In this case the tax would have to be relatively high or combined with a command-and-control regulatory approach in order to have a large impact. These considerations contain insights which are also applicable to voluntary initiatives in support of cleaner production, such as those extensively discussed at this seminar.

When we want to encourage enterprises to adopt cleaner production, we are asking them to find ways to substitute one input for another in their current production processes or to change the process altogether (through a minor or major investment), which will reduce the need for an input which we would like to discourage.

Why should a business firm do this? Some of the answers might be:
- to save costs by pursuing "eco-efficiency",
- to increase market share by advertising as a "green firm" – aided by certification under an eco-labelling scheme;
- to save costs by reducing use of a substance subject to environmental taxes or charges;
- to respond to regulatory pressure, which may be actual or anticipated.

What do such reflections suggest about the role of cleaner production centres and the probabilities of their success?

If we consider the background conditions of countries where cleaner production centres operate, differential success may be partially explained by the climate affecting business generally. One may thus ask such questions as:
- Do policy frameworks and market conditions favour rapid entrepreneurial response to change?
- Is the government an effective regulator, not easily corrupted by bribes, etc.?
- If export-oriented, is the product competing on the basis of price alone? Or on quality and therefore advertising? Are the buyers dispersed or concentrated, and therefore more or less likely to reward "cleaner" production?
- Is the public motivated about clean air, clean water, etc., and therefore a source of pressure for cleaner production?
- Can cleaner production centres do much about these background conditions? Probably not.
- Perhaps, however, they could identify barriers to the adoption of cleaner technologies, e.g. import tariffs on photovoltaic cells when electricity equipment such as turbines are duty free.
- Or perhaps they could recommend procurement policies to government at different levels which could expand the market for products produced by cleaner methods.
- On what sorts of products or substances should cleaner production centers concentrate?
- In the case of SMEs producing generic products, targets for improvement must be well within the eco-efficiency boundary and concerned with inputs like energy and chemicals that represent a large proportion of product costs.
- In the case of exporters, they should concentrate on realizing the potential from eco-labelling schemes or on the market segment represented by buyers wishing to be "green".

The conclusions of the seminar on these and other issues will feed directly into CSD deliberation next April and at the ad hoc intergovernmental working group which will meet during the last week of February to prepare for the 7th session. It will continue to influence the Commission as it assesses the impact of changing consumption and production patterns in agriculture and forests in 2000, and in energy and transport in 2001. And of course the contribution of cleaner production to sustainable development will be central to an evaluation of progress at the Earth Summit planned in 2002.

We look forward to continuing our close collaboration with UNEP/TIE in the CSD process and to identifying new areas of collaboration in our technical cooperation work, notably sustainable development strategies and indicators, and financing for sustainable development, sustainable energy, and sustainable water management and development.

1. For detailed case studies in OECD countries, see *Integrating Environment and Economics: The Role of Economic Instruments*, OECD, 1994.

2. For a detailed discussion, see CSD document E/CN.17/1995.

consumption. For producers to meet consumer needs effectively and sustainably, they need an understanding both of what consumers want and of how to deliver this in environmentally sound ways – the demand side of cleaner production.

Marketing is the management process designed to identify and satisfy consumer expectations. Reviewing international experience with consumer demand for cleaner products, it was concluded that consumers aim to fulfil their needs with goods and services that provide the functions required to realize their goals. People care, and do not willingly damage the environment. Therefore, it is important that there is a choice of good quality products and services, good information and feedback, and the facilities/infrastructure to change behaviour. Cases were discussed where even under these conditions people do not always make rational choices. Many factors other than environment play a role in consumer choice, notably quality, safety, health, price and comfort. Business has to decide whether to emphasize the environmental attribute in their marketing efforts or focus on other aspects of a product.

Key elements of discussion

- A distinction has to be drawn between consumers as individuals, businesses or governments. Each requires a targeted approach. For example, consumers living in poverty cannot make choices. Businesses require a different approach when dealing with small and medium-sized enterprises or with multinationals. Governments can influence consumption patterns of consumers and business through policy development and through improving their own performance.
- Consumers do not necessarily desire products as such, but rather the function they fulfil. As a result, new approaches for doing business – providing services instead of products – can be identified. Cases presented included Nike, providing access to sport instead of selling shoes; BP, providing energy services rather than selling oil; and interface, providing floor covering instead of selling carpets.
- The need for more and better information and education is clear. Consumers are still faced with inadequate and sometimes misleading information on the environmental performance of products. Consumers, businesses (including advertising and marketing sectors) and governments can only make the right choices when they are fully informed. It is critical to identify what information is needed, for whom it is intended, and how it can most effectively be communicated. In Korea, consumers who buy cars or electronic goods make decisions based on quality, safety, price and comfort; the environmental aspect plays no role. Recent research in Korea showed that the main sources of information for individual consumers are television, newspapers and schools.
- More understanding of the factors that drive consumer choice is required. Even when there are environmental concerns, this does not necessarily translate into action.
- Consumers often want to make a difference both by boycotting products, motivated by environmental concerns (e.g. Shell and Brent Spar), and by taking part in consumer programmes to change their lifestyles (e.g. Global Action Plan).
- We need to better understand the effects of advertising and the possibilities for advertising as a tool in policy development and implementation. Advertising can promote cleaner products and services and create demand for lifestyles that are more sustainable.
- Business, in cooperation with governments, international organizations and NGOs, should develop strategic approaches to prevent confusion, competing claims and an overload of environmental information.

Recommendations for future work

The following broad clusters were identified, including some specific actions:

1. Clarify the issue:

- distinguish between consumer categories: individuals, businesses and governments;
- highlight the linkages between cleaner production and sustainable consumption;
- assess the relationship between sustainable consumption and social aspects such as ethical considerations.

Examples of possible actions:

- establish working groups on the different consumer categories;
- analyse the driving forces behind consumption patterns.

2. Provide information and education:

- identify the specific needs for the different consumer categories;
- available information needs to be analysed and made accessible to the specific categories in developed and developing countries;
- identify the most effective medium for promoting cleaner production practices.

Examples of possible actions:

- empower consumer organizations and other NGOs to provide information to the public, and campaign on cleaner products and business practices;
- educate marketing and advertising professionals on sustainable consumption and cleaner production (e.g. through training workshops, guides, tool kits);
- produce a television series for business decision-makers on cleaner production, including information on eco-design, supply chain management and marketing.

3. Foster partnership with business:

- distinguish between SMEs, large corporations and multinationals;
- identify the appropriate approach to the key decision-makers;
- involve marketing and advertising professionals.

Examples of possible actions:

- identify effective ways to communicate the sustainable production and consumption message to CEOs and other corporate decision-makers, emphasizing quantifiable benefits and risk reduction;
- understand how corporate pioneers have made the shift to providing services, and make case study information available to business executives so that they can learn from their peers;
- organize a workshop to identify the role of marketing and advertising;
- assist SMEs and producers in developing countries to market their cleaner products;
- reward good business practices by collecting and disseminating success stories and issuing benchmark prizes.

4. Facilitate strategy development:

- link existing cleaner production and sustainable consumption networks;
- publicize successes and encourage new ways of doing business.

Examples of possible actions:

- use marketing skills to promote cleaner production;
- identify key networks, including local networks all over the world, and encourage links to facilitate information exchange;
- identify existing sustainable practices in production and consumption, particularly in developing countries, and develop policies for supporting and extending them.

The parallel session identified a growing agenda linking cleaner production with sustainable consumption. UNEP clearly has a role to play in catalyzing international action and partnership.

Small and medium-sized enterprises

The parallel session on small and medium-sized enterprises was chaired by Surya Prakash Chandak, Director, NCPC, India, with Edward Clarence-Smith, Senior Technical Advisor, Cleaner Production and Environmental Management, UNIDO, as rapporteur.

Participants' discussions provided responses to five critical questions as follows.

1. What role should cleaner production intermediaries play in promoting cleaner production in SMEs?

- provide advisory/information services, well-tailored to the needs of the SMEs in that particular country;
- develop appropriate training programmes and train the trainers;
- interact with policy formulators to develop appropriate policies;
- foster industry-industry cooperation, both horizontally and vertically;
- assist and promote cleaner production investments;
- make cleaner production an integrated part of service packages offered by well-established intermediaries;
- encourage SMEs to make better use of their internal capacities.

2. What can the intermediaries do to exchange experiences and share resources for reaching SMEs?

A strong call was made to encourage the use of the capacity built in an NCPC in other NCPCs, at least in the same region, rather than having recourse to experts from developed countries. There was recognition of the fact that there are many methodologies and tools available to better work with SMEs. Participants made clear that they felt information exchange of this kind could be very useful.

Members of the high-level plenary panel

3. Are participants carrying out any relevant SME-related activities?
All participants were, in some way or another, carrying out cleaner production activities with SMEs.

4. What role should international organizations play?
Several issues were raised:
- In bilateral/multilateral projects, there should be greater stress on involving and sensitizing local consultants, engineers, designers, equipment manufacturers, etc.;
- Demonstration projects should not be a vehicle for technology transfer, but for demonstrating the cleaner production process itself;
- Programmes need to be less input-oriented (how many new centres, etc.). They need to define impact indicators and evaluate projects more critically. They need to strive for broader application;
- Programmes need to be structured in a manner which reduces implementation efforts;
- The new UNEP investment promotion project was highly commended;
- It was stressed that all projects should take a step-by-step approach, at each step carefully building up the necessary capacities for the next step;
- UNEP should examine different existing models of assistance to cleaner production R&D;
- International organizations should link different development programmes more with cleaner production, cutting down unnecessary competition.

5. How can lending institutions best support cleaner production efforts?
Several issues were raised:
- There was great interest in Dutch experience with a revolving fund for cleaner production technical assistance. The use of revolving funds for cleaner production investments was also commented upon.
- Cleaner production should be integrated with industry modernization/productivity improvement projects, since lending institutions are very interested in the latter.

Developing regional cleaner production initiatives

The parallel session on developing regional cleaner production initiatives was chaired by Donald Huisingh, International Institute for Industrial Environmental Economics, Lund University, Sweden, and reported by Brian Robinson of the Environment Protection Agency, Australia.

Successful promotion of the cleaner production strategy world-wide has led to the evolution of regional initiatives and events such as conferences, roundtables and seminars. In the last year alone this has included the First Asia-Pacific Roundtable in Bangkok, the Southern African Regional Conference on Cleaner Production in Johannesburg, the European Round Table on Cleaner Production in Oslo, the Conferencia Regional de Alto Nivel en Producción más Limpia de America Latina y el Caribe in Cartegena, the US National Pollution Prevention Roundtable in Cincinnati, and the Cleaner Production Conference of the Americas, Sao Paulo. US-AEP has also been engaged in establishing cleaner production roundtables in the Philippines, Indonesia, India, Malaysia, Korea and Thailand.

This parallel session reviewed such initiatives and looked for ways to strengthen partnerships and coordination to maximize impact and minimize duplication. Participants concluded that:
1. Regional initiatives can be particularly valuable in: exchanging experiences; harmonizing with trade/economic parameters; reinforcing successes; providing critical mass and economies of scale; and reducing duplication of effort.
2. Four major types of regional initiatives exist: roundtables; other forms of networking; regional conferences; and regional capacity building.
3. To be successful, regional initiatives should: have clear objectives and environmental performance indicators; engage the key players; be demand-driven; have a strategic focus; be action-oriented; and have a clear delivery mechanism.
4. There is a need to: evaluate the transferability of models; establish mechanisms for linking regional initiatives to enterprise initiatives; and facilitate more open exchange of information (e.g. within an industry sector).

Recommendations
- Leadership for regional initiatives must continue to come from "local" actors;
- UNEP to act as "coordinating" agency of such regional initiatives and encourage, support and, where appropriate, facilitate regional activities;
- Establish a listserver for existing participants to further develop ideas;
- UNEP's sixth biennial cleaner production seminar should host a global meeting of regional groups;
- There should be greater effort to gain more industry involvement;
- A database of regional activities should be established.

Cleaner production innovations in different industrial sectors

The parallel session on cleaner production innovations in different industrial sectors was chaired by Lee Byungwook, POSCO, Korea, with Ritu

International Cleaner Production Information Clearinghouse (ICPIC)

The collection and dissemination of cleaner production (CP) information is one of the important ways UNEP fulfils its commitment to the cleaner production concept. Through ICPIC, the transfer of information is facilitated and awareness of the cleaner production concept is created.

UNEP Technology, Industry and Economics (TIE) has developed and distributed three versions of the ICPIC diskette. In May 1999, a new CD-ROM version will be launched. The change from diskettes to CD-ROM was made for ease of production, distribution, installation and use.

ICPIC CDV 1.0 is a collection of cleaner production databases that can assist industry, government, non-governmental institutions and academia implement cleaner production in developing as well as developed countries. This is done by providing examples of technical and policy applications, abstracts of available publications, lists of expert contact institutions, and information on sources available from UNEP TIE.

ICPIC disseminates information through a number of mechanisms, including the CDV 1.0. ICPIC also provides hard copy documentation of diskette/CDV information and has an E-mail connection (see below) which enables users to pose questions about cleaner production. This query response service provides individualized responses.

The ICPIC CDV is considered an information tool that is always "in progress". It is continually updated and improved on a regular basis. UNEP TIE solicits feedback on the content and operation of this CDV because there is interest in learning the usefulness and appropriateness of the material.

Another ICPIC product is *Cleaner Production: A Guide to Sources of Information*. This hard copy publication helps readers identify relevant sources of information and technical assistance more efficiently and increase awareness of the richness of the support institutions and materials available. Information on how to order the guide is available by E-mail or from the cleaner production web site.

The ICPIC databases are on the web and searchable, or can be ordered at UNEP TIE. The direct E-mail and web addresses are:

E-mail: **icpic@unep.fr**
Internet: **http://www.unepie.org/icpic/icpic.html**

Kumar, Commonwealth Science Council, UK, as rapporteur. Cleaner production strategies in the steel, metal finishing, construction and chemical industries were presented in this section.

Steel. Louis Wibberley of BHP, Australia, emphasized that in general the steel industry has not adopted a strategic approach to cleaner production, although there are many examples of cleaner production projects arising from specific opportunities and problems. This is because the cleaner production culture has not developed fully. However, BHP has adopted the wider perspective of sustainable development, of which cleaner production is one component. The bigger picture uses a life cycle/systems analysis approach and has established a Sustainable Technology Programme based on a strong and developing modelling capacity (LCA, techno-economics, and process modelling). Without substantial process integration, only incremental improvements are possible. The new approach has stimulated new thinking and has resulted in a research project on coal/ore composite pellets, which has the potential to improve both the economic and environmental aspects of iron production on a continuous basis.

Metal finishing. The presentation on environmental benchmarking in the metal finishing industry by Darrell Reeve, UNEP Cleaner Production Working Group on Metal Finishing, highlighted the importance of working at the sectoral level with a team of specialists as a way of implementing cleaner production practices. The overall objective of developing benchmarks for the metal finishing industry is three-fold: to create awareness of opportunities for techniques using zinc or steel; to provide benchmarking criteria relating to eco-efficiency and waste; and to provide practical examples of cleaner production for the sector. The assessment criteria used for benchmarking include: power, water and chemicals usage; effluent streams and closed loop possibilities; corrosion resistance; process sustainability; and risk assessment. Six countries participated in the project and provided data on the above mentioned parameters. It was noted that difficulties were encountered in obtaining data from companies for various reasons, mostly relating to confidentiality. In addition, very often the responses were biased and it was difficult to obtain a level playing field for comparison.

Construction. The presentation on the construction industry by Wim Kirsten of Friends of the Earth, the Netherlands, emphasized the importance of reducing carbon emissions from the building and construction sector. Various ways in which this may be achieved include: recycling of cement; use of emission-free materials; reduced use of cement and concrete; use of sustainably produced timber; reduced use of aluminium and PVCs; and higher degrees of insulation. One way the industry may be prompted to adopt these measures is that followed in the Netherlands, in which industry has entered into voluntary agreements with the government to reduce emissions of CO_2 per unit of product (and more generally bring down the environmental space per capita). Although this has worked quite well in the Netherlands, there is the danger that overall reductions in emissions per unit of product could be overshadowed by an increase in the total volume of production, thereby increasing overall emissions.

Chemicals. The example of the chemical industry's Responsible Care initiative, presented by Judy Castledine, Dow Chemical Pacific, is another case where voluntary initiatives on cleaner production have been successful. The initiative has spread to a number of countries in Asia, including Malaysia, Singapore and Thailand, where governments are key partners. In the presentation the fundamental features of Responsible Care were listed, and the link with cleaner production through the guiding principles of the initiative and the pollution prevention codes inherent in it was emphasized. The objective of the pollution prevention code is defined as the prevention of environmental impacts through minimization of waste and emissions, proper design facilities, and good waste management practices. As such, cleaner production is not just emission reduction but also a hierarchy of waste management practices *and* a change in attitudes and behaviour.

Petrochemicals. Zhouping Lai of SINOPEC (China Petro-Chemical Group) presented his company's measures leading to cleaner production. These include: environmental audits, setting up of expert teams responsible for demonstrating cleaner production methods, training schemes for management and technical personnel, and implementation of demonstration projects. Results from the first round of demo projects in 24 units identified several low-cost options involving improved managerial practices and three high-cost options involving technical and process modifications. Overall, it was found that cleaner production promotes the development of enterprises and reduces waste discharges.

Although the presentations covered different industrial sectors, the following common factors and conclusions emerged from the discussions:

- Cleaner production, on its own or as part of a sustainable development programme or initiative, is an economically and environmentally viable practice;
- Cleaner production involves much more than technological change: it requires a fundamental change in attitude and behaviour;
- Cleaner production requires industry to take the initiative, but it should also be assisted by support from government and civil society;
- Cleaner production is profitable in the long run: there may be start-up costs for adopting cleaner production options, but in the long run it pays.

Cleaner production and environmental management systems

The parallel session on the integration of cleaner production goals into environmental management systems was chaired by Vladimir Dobes, Director, Czech Cleaner Production Centre, with Matthias Gelber, 14000 1 One Solutions, UK, acting as the rapporteur.

1. Compatibility of cleaner production and environmental management systems

It was clear from the session's presentations and shared experiences that good examples exist of a company's environmental management system serving as a catalyst for cleaner production (ISO 14001 certified companies in China, Indonesia and Slovakia), while other examples (in the Czech Republic, Poland and China) demonstrated that companies introducing cleaner production techniques into their activities were subsequently motivated to move towards the development of an ISO-certified environmental management system. Participants echoed the view that their cleaner production and environmental management systems are complementary. The CP strategy can support and strengthen the EMS tool, while CP audits or assessments can assist in the implementation of an environmental management system or the delivery of ISO 14001 requirements. Environmental management systems, whether certified or not, are an important tool to support continued cleaner production improvements. It was therefore recommended to foster integrated implementation of EMS and cleaner production, in order to provide companies with the most cost-efficient framework for sustainable development.

2. Standardization in TC 207/ISO 14001

With the possible revision of ISO 14001, a window of opportunity currently exists to foster the integration of cleaner production in environmental management system standards. A review questionnaire recently circulated by ISO Technical Committee 207, Subcommittee 1, intends to collect information about experiences related to implementation of ISO 14001 and related technical issues. Comments can be submitted via national standards committees or organizations with ISO TC 207 liaison member status (the ISO questionnaire was disseminated to participants). Some cleaner production stakeholders (mainly in the United States) are already involved in the process and debate at the national level.

A new standard on design for the environment will be initiated, and there is increasing demand for TC 207 to tackle the issue of environmental reporting. Furthermore, other ISO 14000 standards such as eco-labelling, environmental performance evaluation and life cycle assessment, could be used to promote and implement cleaner production. In the context of work on further standards in the ISO 14000 series, the cleaner production community should lobby for an enhanced cleaner production orientation.

3. Recommendations

The following issues were seen as priorities for UNEP:

- Experiences with integration of cleaner production and environmental management systems need to be evaluated and disseminated. There is a need for clarification of the relationship between cleaner production and environmental management systems, and of the benefits of joint implementation, as well as a need to communicate how cleaner production management tools are beneficial to EMS implementation.
- Capacity building, and methodologies for integrating cleaner production and environmental management systems without a focus on formal certification, need to be developed, particularly to meet the needs of SMEs.
- UNEP should evaluate whether a more comprehensive strategic involvement in TC 207 is desired, beneficial and cost-effective (UNEP has liaison status). Information about lobbying opportunities should be disseminated to cleaner production activists (e.g. through cost-efficient Intranet channels)
- Stakeholders should be encouraged to contact their TC 207 country representatives to promote cleaner production through ISO 14000 (e.g. through identifying cleaner production opportunities in initial review aspects by specifying that cleaner production is a cost-efficient technique for achieving pollution prevention, etc.).

The Korean Environment Institute (KEI), co-organizers of the UNEP Fifth International High-level Seminar on Cleaner Production, has published its report on the seminar. The 340 page report includes all the welcome addresses, background papers and presentations, contact information for participants, as well as some documents in Korean.

For more information, contact: KEI, 1049-1 Sadang-Dong, Dongjak-Gu, Seoul, 156-090, Korea. Tel: +822 3488 7634, Fax: +822 3488 7644.

Supply chain management

The parallel session on supply chain management was chaired by Professor Ihab Farag, Chemical Engineering Department, University of New Hampshire, USA, and reported by Conchita C. da Silva, US-Asia Environmental Partnership, Philippines.

The environmental performance of a company's suppliers is becoming an integral component of a company's environmental management system. Currently there is no systematic approach to supply chain environmental management, although a number of companies (e.g. Nike, Volvo, Nokia, etc.) are developing their own initiatives and thus have some experience with influencing the environmental performance of their suppliers. This session helped shed some light on key challenges and priority areas in regard to furthering the development of supply chain management.

1a. What are the main challenges for supply chain management, and the difficulties suppliers encounter when adapting to clients' environmental requirements?

- There are benefits in terms of reduced risk, meeting ISO 14000 standards, EMS, etc.
- There is a need to increase awareness of the strategic connection between purchasing and environmental performance and to work with procurement personnel.
- There is a need to communicate supply chain environmental management experience to consumers and other stakeholders.

1b. Specific challenges for suppliers include:

- rethinking the options available and acquiring materials that are less toxic, less persistent and bioaccumulative, etc.;
- raising customer awareness;
- getting financial institutions involved and integrating environmental criteria in their lending decisions.

2. Is there a need to develop guidelines for supply chain environmental management?

Participants did not believe there is a need to develop common guidelines for developing supply chain environmental management world-wide, but they felt that general principles such as those developed to guide companies in formulating their environmental policies should be established.

3. How can the cleaner production concept be integrated in supply chain management?

Looking at the true cost of doing business, you will gain a better appreciation of the savings involved in practising cleaner production and adopting supply chain environmental management. It could provide an opportunity to find new market niches.

4. Possible roles for UNEP and governments in encouraging supply chain environmental management suggested by participants are:

a) UNEP should:

- develop a questionnaire template to be sent to companies, which they could send to their customers and suppliers. This would help companies understand (or rate) supplier performance. It should not be too long (e.g. ten questions);
- organize a workshop to discuss supply chain

environmental management issues facing industry, involving interest groups, supply chains, purchasing managers;
- develop case studies/success stories regarding supply chain environmental management;
- develop metrics/performance indicators to be used to monitor progress and success in supply chain management;
- develop a training programme specifically for purchasing managers to explain cleaner production and supply chain environmental management. This will help to ask the right questions, interact with the environmental community, and develop a supply chain environmental management system;
- work with the National Association of Purchasing Managers (Arizona, USA) and others to identify resources and tools (e.g. UNEP's cleaner production database) for both purchasing companies and suppliers;
- promote environmental management systems that can be linked internationally;
- build safeguards for transparency and quality of information;
- organize an international forum for exchanging experiences.

b) Governments should:
- strengthen the enforcement of environmental regulations;
- become a purchasing model;
- provide incentives to companies (tax breaks, licensing fee reduction, etc.);
- not manage the supply chain programme.

Eco-design

The parallel session on eco-design was chaired by Thierry Kazazian, O2, France, with Martin Charter, Centre for Sustainable Design, UK, acting as rapporteur.

The last 30 years have seen a seen a shift from "end" to "middle" to "front of pipe" thinking. Much of the first phase of eco-design and sustainable product design has focused on the production side of the equation. A second phase now focuses on the consumption side, underscoring the need for eco-design to address the wider "service" aspects of products that motivate consumer demand.

There was general agreement that there is no or very little governmental support for eco-design world-wide. At the overall level eco-design is being supported; however, when it comes to real support (research and development, instruments, resources, etc.) very little is actually in place. The necessary instruments for supporting and promoting eco-design are often not the same as those for supporting and promoting cleaner production with respect to production processes. However, these instruments for production processes are often just being applied to product development as well, which does not necessarily provide the desired results. It was therefore suggested that UNEP prepare a "road show" to be presented to ministries of environment and industry, etc. explaining the environmental and economic potential of eco-designed products and the need for supporting eco-design activities in general.

The potential of "reactive copying" was discussed, based on experiences in Colombia. This can be described as:
- copying eco-designed products already on the market;
- copying conventional products on the market and; then subsequently
- integrating the environmental aspects of the products.

With strong competition in Colombia from cheap imported products (which often do not comply with environmental standards), it is not economically viable to undertake a traditional eco-design process. A shortcut can be taken while learning from products already on the market, i.e. copying and comparing to what has already been done. Such a methodology can be compared with a traditional benchmarking tool, which it could be interesting to further develop for the eco-design process.

It was recommended that eco-designers focus more on the aesthetics of products in order to attract consumers. The first wave of "bamboo" eco-design products is over, and in the future it will be necessary to develop modern and innovative eco-products that better reflect consumers' requirements.

The relationship between LCA and eco-design was also discussed. LCA is a valuable tool to supplement and support eco-design activities. However, important product improvements (often up to 25% after two days of work) can be identified by using common sense and not necessarily detailed LCAs The further development of simple, practical eco-design tools was recommended, rather than a narrow focus on detailed, academic LCAs. It is also very important to present "breakthrough concepts": designers must also conceive services, not only product, because the need of the consumer is not the product but the use.

It was also recommended that UNEP assist more in raising general awareness about eco- design and the potential for environmental benefits through success stories in publications or road exhibitions.

Information exchange and sharing

The parallel session on information exchange and sharing was chaired by Marianne Lines, Canadian Centre for Pollution Prevention, and reported by A. Koh, Asian Productivity Organization, Japan.

Participants in this session discussed the most useful sources and types of information and how this information is best disseminated in light of the rapid evolution of communication technologies. In regard to the sources of information, it was reaffirmed that trade associations, suppliers and governments are important. The most useful types of information gathered depend upon the location, size, culture and nature of the end-users. It was confirmed that information specific to improving environmental performance is important to end-users.

While electronic means of exchanging information are becoming increasingly important, traditional methods of information delivery, such as personal contact and hard copies, remain essential. Such delivery should be clear, well-focused, reliable, relevant and economically beneficial, with the right information at the right time.

Global and local intermediaries are critical to the dissemination of information to end-users. However, they need to be specific to the needs of these users. Decentralized management of data can be effective. Case studies are considered important, as they provide useful examples for others to follow (many of the case studies produced tend to be technical in nature, and there is a need for more management-oriented case studies such as EMS). Most case studies are based on success stories. However, failures and lessons to be learnt, as well as approaches to solutions, are useful. Information on benchmarking has to be integrated in the information system. This would allow comparisons by similar industries for their use.

Entrepreneurs want information that will enable them to take decisions which can be applied in a down-to-earth commercial manner. Caution is needed in using benchmark figures, as they may not be applicable in different market systems and at different times. It was observed that there is already too much information on the electronic system. Quality assurance is needed to ensure that the right information is put in the right place.

Cleaner production and awareness programmes at different levels, especially governmental policy and educational levels, are critical for cleaner production capacity building and growth. Due to the proliferation of different sources of information from different organizations and agencies, access to information is becoming complex. This has led to information being too costly to obtain. Furthermore, there is lack of management support within industry. Sharing of information is also difficult due to a lack of skilled personnel and regulatory support.

Cleaner production centres require the following knowledge:
a) how to identify sources of information;
b) how to cooperate with other organizations, especially those close to industry.

It was generally felt that support from international organizations such as UNEP is important in building up information systems.

Recommendations and actions
- Investigate a forum for ongoing communication between information providers. One possibility is to establish an international workgroup on information sharing;
- Initially, the Canadian Centre for Pollution Prevention will chair a workgroup and:

a) confirm interest in a workgroup;
b) with the workgroup, define its role which might include:
- communication between providers
- providing direction to organizing information (tools, resources, cleaner production centres, etc.)
- recommendations on how to make information more useful to end-users
- identification of gaps and improvements to existing information

c) investigate ways to communicate – possible use of existing listservers.

Choi Jae-Wook, Minister of Environment of Korea, Klaus Topfer, UNEP's Executive Director, and Kang-Hyum, Minister of Commerce, Industry and Energy of Korea, answering questions during the press conference

Pre-meetings

UN Inter-Agency Meeting, 28 September 1998

UN agencies and other intergovernmental organizations must constantly stretch their human and financial resources in their attempts to meet the often shifting programme needs and expectations of their member countries. Consequently, inter-agency opportunities to coordinate UN activities are few and far between. The biannual UNEP High-level Seminars on Cleaner Production provide one such rare opportunity. Intergovernmental organizations attending the conference arrived a day early to meet and exchange information on current priorities, programmes and activities, and to identify opportunities to further coordinate activities to strengthen the delivery of their cleaner production related efforts.

Kenneth Ruffing, Officer-in-Charge, Division for Sustainable Development, UN Department of Economic and Social Affairs, chaired the meeting. Participants included the Secretariat of the Basel Convention on Transboundary Movements of Hazardous Wastes, Habitat, United Nations University, the Asian Productivity Organization and the European Commission, as well as UNEP's Division of Technology, Economics and Industry and UNEP's Regional Office of Western Asia.

Sustainable consumption, one of the major themes of the seventh session of the Commission on Sustainable Development (CSD) in April 1999, provided the first focal point of discussion, providing an opportunity for the CSD Secretariat to: share its work programme with participants; better understand the work already being done by other UN agencies; and find ways to work in a way that optimizes existing interagency experience and expertise in preparing background papers for the CSD, developing sustainable development indicators, and carrying out other current or proposed CSD work programmes.

Each intergovernmental organization provided an informal summary of its current and future activities, fostering an open and candid discussion of needs, priorities and opportunities for coordination and cooperation. Among the many topics discussed and probed for greater cooperation were:

- international conventions: better coordinating activities of international environmental conventions and fostering of mutually beneficial links (e.g. information databases) between convention secretariats and regional centres (e.g. Basel centres) and National Cleaner Production Centres (NCPCs) and activities;
- sustainable cities: fostering better decision-making for sustainable consumption and production among local governments for sustainable cities;
- advertising and marketing: better understanding the role of advertising and marketing in influencing consumption patterns for input to the CSD session on sustainable consumption.

Meeting of Asian Industry and Trade Associations, 28 September 1998

This meeting brought together representatives from Asian industry and trade associations to discuss current activities and identify new initiatives. The meeting was similar in design to the annual UNEP consultation with industry and trade associations held in Paris. Ungsuh Kenneth Park, Counselor, Samsung Group, chaired the meeting and in his introductory comments asked participants to think of what the group could be doing better to further promote preventive environmental management practices. Jacqueline Aloisi de Larderel, Director of the UNEP Technology, Industry and Environment Division, outlined the mission of UNEP IE and, in doing so, presented a framework for shaping the discussion.

Presentations covered a range of industry related issues. Ning Duan, Director of the UNIDO/UNEP National Cleaner Production Centre, spoke on how the Centre designs its training to attract industry and build capacity in order to carry out cleaner production in the long term. It also offers services in areas such as ISO 14000 certification to attract companies. Dr Lehni from the WBCSD outlined some of the current activities it is involved with, including the new document produced in conjunction with UNEP IE on eco-efficiency and cleaner production.

Won-sup Lee, Senior Managing Director of Pohang Iron and Steel Co., outlined the role the Climate Change Convention has played in shaping the activities of the Korean iron and steel industry. Finally, Peck Than Guan, Deputy Director of Singapore's Productivity and Standards Board, gave an overview of ISO 14000 developments in selected Asian countries. The Asian ISO 14000 information network conducted a survey of its members to ascertain the advantages and disadvantages of ISO 14000. Most countries replied that an ISO 14001 certificate helps improve the company's image, results in waste reduction, and helps conserve resources. The negative side of ISO 14001 is that it increases costs and results in more paperwork. He also described the importance 14000 has played in "opening the door" of industry. Once opened, the group has been able to push the cleaner production agenda. He reiterated what other speakers had noted, that industry does not care about the environmental vocabulary used. They are motivated by profits, which include trade and market share issues. These are the "doors" for getting into industry.

The morning discussion solicited comments that the meeting itself was an important vehicle for sharing and discussion of these ideas. The group was interested in all the different exper-

iences, and noted that there are not many such vehicles. Participants felt that industry and private sector involvement in promoting better environmental management practices is not that far along. The chair challenged the group and asked if there was a need for an ongoing meeting of this nature: did there need to be an Asian UNEP Industry Trade Association? Participants felt that creating another organization might not necessarily be the best way to use resources, and suggestions were made to more efficiently use existing mechanisms. For example, the 2nd Asian CP Roundtable in Brisbane, Australia, in 1999 would be an excellent opportunity for industry to host a parallel event. The group stressed the need to facilitate more communication among such organizations and to foster new ones.

The morning session also underscored the need to improve delivery of cleaner production information, i.e. better networking, work to clarify concepts, and the need to involve the financial sector.

These themes were carried into the afternoon session. Conchita Silva of the United States Asian Environmental Partnership chaired the afternoon proceedings, during which a more in-depth discussion took place on how to expand and connect the growing number of industry related groups involved in preventive environmental practices. The group had difficulties coming up with concrete ideas on how to foster development of similar groups. It was noted that issues like ISO 14000 have provided an impetus for new organizations to develop. UNEP outlined ongoing activities in corporate environmental reporting, cleaner production, energy efficiency and other climate change related initiatives which are examples of practical initiatives industry could undertake.

For example, the Federation of Chamber of Industries in Sri-Lanka has initiated innovative financial mechanisms to promote implementation of cleaner production. The chamber encourages membership of environmental consultants, to actively participate in environmental site assessments of industries. Member firms which receive environmental technical support from the chamber pay only when monetary savings are realized from the implementation of EMS and CP.

The importance of networking was discussed at some length. Participants agreed that communication modes like E-mail, Internet and hard copy, though important support mechanisms, are secondary to face-to-face contact, especially given the "newness" of electronic communication. The Korean representative maintained that there is need to decipher cleaner production into business language. This was seconded by the representative of a Pakistan industry association, who strongly asserted that (in that part of the world) other cleaner production practitioners/organizations have

Promoting cleaner production investments in developing countries

Capital investments in developing countries have multiplied during the 1990s. International financing institutions such as the World Bank and regional development banks have played an important role in this development, but the most spectacular growth has taken place in private sector investment. For the most part, these investments have been similar to those that were the pattern during OECD countries' industrialization period. Such investments, while necessary, often lead to increased pollution and energy and natural resource use.

Challenge

Globalization presents a major challenge to developing countries in their attempts to promote economically viable domestic and international investments, decisions which are generally taken based on financial criteria. Ecological considerations often relate to environmental impact assessments (EIAs) and/or emission standards only. The challenge is to maintain growth in investment without depleting resources and burdening the environment any further. One effective way to achieve such sustainable development is to redirect the flow of capital towards cleaner production, i.e. to direct local industries and financial institutions to demand and use CP technologies and practices.

The high economic growth rates experienced in a number of developing countries (with a period of recession hitting some of them recently) have provided businesses with the opportunity to improve the eco-efficiency of their operations. It has been estimated that, between 1994 and 2001, up to 85% of Asia's installed industrial base and perhaps 70% of its energy-producing capacity will be new. This presents an opportunity to avoid the costly waste management solutions the industrialized world has had to cope with. Whether countries seize this opportunity depends greatly on the types of technologies they choose to adopt, and on the availability of appropriate financing.

Main constraints

Investments in CP can be attractive economically due to reduced costs of input materials, energy and water, and waste treatment and disposal, as well as increased production and better output quality. These investments' payback period may, however, be longer than is customary in a typical EIA for new investment. Small and medium-sized industries have a particularly hard time making CP investments for a variety of reasons, ranging from the cost of capital to the absence of appropriate funding mechanisms. Furthermore, CP is less likely to be economically attractive in countries with few and lax environmental regulations, under-priced or free natural resources, and no green consumer movement.

Problems to be addressed in customized efforts to promote CP investment in developing countries are summarized in the box below.

Investment project preparation and financing

Decision-making processes can be adapted and improved to translate CP assessments into feasible investment options. In most companies there is a single capital budgeting pool for all projects, meaning that CP investments must compete with other project options for financing. Even though a company has set environmental objectives, this does not automatically result in lower hurdle rates for environmental projects.

To shift the emphasis towards CP options, two ways of influencing the capital budgeting process at the company level can be considered:

- developing and promoting the use *of improved management accounting systems, techniques and practices* which facilitate a reasonable inclusion of environmental costs and benefits and favour the participation of various departments and management layers in the decision-making part of the process;
- promoting the use of *differentiated hurdle rates* for the approval of CP projects.

In addition, governments can introduce *policy incentives that reduce the capital cost* of the CP investment (e.g. by tax credit or import tax exemption) or increase the operational benefits of this investment (e.g. by rational pricing of natural resources, environmental levies, low VAT on cleaner products, etc.).

Even where the management of a company has the intention to invest in CP, the implementation of such a proposal can still be hindered by a lack of financial resources. The appraisal of a loan application from a *commercial bank* depends not only on the way financial costs and benefits are identified and quantified, but also on the existing relationship between the bank and the company and on the firm's overall credit-worthiness. The following considerations may help banks to orient their lending towards CP:

- management competence (CP as an integral part of Total Quality Management);
- cash flow (CP as a means of reducing the costs of environmental compliance);
- long-term competitiveness.

In terms of *equity financing*, companies must comply with normal reporting standards to generate capital through issuance of shares. As environmental awareness increases, shareholders may consider ecological factors in their investment behaviour. This has led to the emergence of green investment funds; for instance, the Swiss Bank

not reached them, cleaner production communication is therefore not taking place, and they are unable to learn what is going on with cleaner production practitioners. The group supported getting industry and trade association representatives together at the 2nd Roundtable

Role of National Cleaner Production Centres

During the conference, representatives of the National Cleaner Production Centres (NCPCs) met regularly to discuss the evolution of their role in promoting cleaner production in their countries, in the context of: 1) the International Declaration on Cleaner Production; 2) the Norwegian Finance Project: Strategies and Mechanisms for Promoting Cleaner Production Investments in Developing Countries; and 3) international environmental conventions. The session was chaired by Jonathan Hobbs, Coordinator, Cleaner Production Programme, UNEP. Rapporteurs were Michael Joergensen of the Technical University of Denmark and Leo Baas of the Erasmus University, the Netherlands. The following is a summary of the group's discussions and recommendations.

1) The International Declaration on Cleaner Production

It was anticipated that the International Declaration on Cleaner Production will support the UNIDO/UNEP National Cleaner Production Centres (NCPCs) in their policy work. In order to do that, it is important that the declaration is available in local languages so that it can be used directly at national level by the centres. Translation is already under way.

On the other hand, the NCPCs can support the declaration and should have an active role in connection with it. In the initial phase, this could take the form of assisting UNEP in launching and disseminating the declaration. The NCPCs could help in building contacts for the declaration, i.e. in industries, and in formulating a strategy for its further implementation.

Subsequent to the launch, the work connected with the declaration can be summarized as follows:

- promote the declaration locally;
- support its implementation;
- monitor its progress.

As for local promotion of the declaration, the NCPCs are perfectly suited to do this given their many local and international contacts as well as their role as national focal points for cleaner production in their respective countries.

Concerning implementation, it was recommended that UNEP, while communicating with ministries and industries, suggest the NCPCs as national bodies with a role in national implementation of the declaration. This could be done in an

Problems to be addressed	Underlying causes – national level
1. Inability of financial institutions and industrial authorities to assess the technical and financial merits of CP investment proposals.	◆ Impact of CP on profitability of investments and credit-worthiness of borrowers not understood by credit providers. ◆ Inability of credit providers to assess the CP content of investment proposals.
2. Lack of credit schemes customized to CP investments.	◆ Limited development stage of banking system, reflected in focus on traditional collateral values (land and buildings), short repayment periods and provision of working capital only. ◆ High interest rates, (largely) caused by macro-economic and financial instability.
3. Inability to develop credit-worthy CP investment proposals.	◆ Lack of CP assessment capacity, with those CP assessments undertaken not directed to result in credit-worthy investment proposals (including business plans).
4. High cost of CP implementation.	◆ Limited local availability of CP-adapted technology and devices and engineering and installation services. ◆ Perceptions regarding high technology risks associated with CP investments.
5. Lack of enabling environment for CP.	◆ Lack of conducive policy environment for CP. ◆ Lack of demand for CP from industrial community.

Corporation (SBC) offers the possibility of investing in "ecological leaders" or "innovators" with a significant window for CP opportunities. Another alternative source of financing is *leasing*, which can be geared towards facilitating the financing of CP investments.

The success of *environmental funds* depends on the extent to which they manage to attract capital. Such funds can encompass various financial structures, including restricted accounts, lines of credit, revolving loans and guaranty funds with special emphasis on CP. For instance, in 1997 the Nordic Environment Financing Corporation (NEFCO) launched a revolving facility for CP investments in Lithuania and Northwest Russia. *Development assistance* presents a specific form of special-purpose funds that are often provided through financial intermediaries in developing countries. A credit line for CP financing in China is an example.

UNEP's response

In 1998, a project on "Strategies and Mechanisms for Promoting Cleaner Production Investments in Developing Countries" was launched by UNEP. The project, funded by the Government of Norway, will demonstrate how investments in CP can be stimulated by helping financial institutions to understand its benefits, and by training national experts to develop credit-worthy CP investment proposals. Demonstration activities are being organized in Guatemala, Nicaragua, Tanzania, Vietnam and Zimbabwe. UNIDO/UNEP National Cleaner Production Centres (NCPCs) support the initiative in all these countries.

The expected results of the project at the country level are:

- more effective interaction between the financial and manufacturing sectors;
- improved ability of public and private financial institutions to assess investment proposals and provide preferential treatment to CP;
- improved ability of technical assistance and CP assessors to develop credit-worthy CP investment proposals and mediate in obtaining funding for their implementation; and
- an increase in CP investment in participating countries, particularly in selected priority sectors.

At the global level, the project aims at developing new instruments and project initiatives (including credit lines, trust funds, policy changes, training, etc.) to foster additional CP. The project will be supported by national coordinators and advisory boards. An international advisory board will provide overall guidance and ensure that there is no overlap of activities between countries or regions. It will use the accumulated experience gained with UNEP's cleaner production activities and the UNEP Financial Institutions Initiative, which promotes the integration of environmental considerations in financial operations and services.

The project will work in close cooperation with partner agencies such as UNIDO, the ICC, the IFC, the OECD, the World Bank, selected bilateral programmes and commercial banks, and UNDP. Project implementation began recently with a major study on past investment practices. The project is scheduled to be completed at the end of 2001. It is led by the Production and Consumption Unit of the Division of Technology, Industry and Economics.

informal, but also in a more formal way via official letters to the respective ministries, etc.

There was general agreement that monitoring the progress of the implementation of the declaration probably would be too difficult for the NCPCs to handle, and that in any case this should be handled centrally by UNEP. It was suggested that UNEP register developments in different countries and give feedback at the biannual high-level seminars.

2) The Norwegian Finance Project: Strategies and Mechanisms for Promoting Cleaner Production Investments in Developing Countries

The project on strategies and mechanisms for promoting cleaner production investments is focusing on how cleaner production can be financed in the five project countries: Guatemala, Nicaragua, Tanzania, Zimbabwe and Vietnam. For these countries, provision of funds does not seem to be the biggest problem but rather how to ensure that the financial institutions channel their money into cleaner production investments. The objectives of the project are to:

- demonstrate how cleaner production activities can be financed;
- develop financial instruments and strategies to start revolving funds;
- motivate key persons in several financial organizations, including private financial organizations.

After the kick-off meeting in Oslo in September 1998, the project's organization has been settled. Its organization in each country will be related to a business organization. The relationship with UNEP has to be fixed per country, i.e. in Zimbabwe the UNEP finance organization will probably be linked to an ongoing DANIDA programme. The NCPCs in the project countries will function as technical advisors.

The role of NCPCs not directly involved in the project could be to provide information about their experiences with how new industries integrate cleaner production into their investments, as well as with how major investments flow in their respective countries.

3) International environmental conventions

The aim of the session was to discuss the possible role of NCPCs in the implementation of international environmental conventions. There are around 900 international conventions at global, regional or bilateral level. An active role of the NCPCs would require that there is a natural link between the concept of cleaner production and the environmental problems that the different conventions are dealing with.

It was agreed that the NCPCs could:

- act as intermediaries of information;
- initiate/implement related projects;
- provide training related to the conventions, i.e. how to reduce the environmental problems that the conventions deal with.

The motives for the NCPCs could be an improved environment as well as better business opportunities and (project) funding.

It is a problem, however, that the NCPCs (and companies and the governments in the NCPC countries) lack an overview of:

- the countries' obligations once they have signed a convention;
- how the conventions could be related to cleaner production;
- modes of implementation;
- possible roles of different stakeholders, including the NCPCs.

UNEP could have a role in this connection, i.e. providing easily understandable information on the above.

The Basel Convention was mentioned as one in relation with which the NCPCs could have a role. In the future, the Basel Convention Secretariat will establish regional and sub-regional secretariats in various countries, including NCPC countries like the Slovak Republic, China, India and El Salvador, in order to help with the Convention's implementation and control. The NCPCs in these countries could provide services relating to minimization of the amounts and toxicity of hazardous wastes.

Progress, conclusions and recommendations

UNEP's Cleaner Production Programme was initiated at the request of the UNEP Governing Council in 1989. At the CP Programme's launch in Canterbury in 1990, it was decided that progress would be reviewed every two years. Seminars have been held in Paris (1992), Warsaw (1994) and Oxford (1996).

On each occasion the cleaner production network has been seen to grow and diversify. Cleaner production promoters and practitioners from around the world have been invited to share their experiences, good and bad, and to help plan priorities for the following two years and beyond. New advocates and allies in the promotion and implementation of cleaner production are also invited.

The success of these seminars can therefore be attributed to what takes place informally in the corridors as well as to the more formal events.

At Oxford in 1996, a set of recommendations was adopted:

- to produce an international protocol on cleaner production;
- to ensure a better balance of attention to sustainable consumption, as well as to production issues;
- to work more closely with the financial sector;
- to establish a benchmarking demonstration project for cleaner production;
- to ensure that all the UNIDO/UNEP National Cleaner Production Centres have Business Plans to which they adhere.

The Fifth Seminar, held in Phoenix Park, was the first outside Europe. Progress in implementing those recommendations was reported:

- The International Declaration on Cleaner Production, after a two-year participative and iterative process, was ready for launching in Korea;
- In addition to the agenda in Korea reflecting more attention to "demand" side issues (life cycle assessment, supply chain management, marketing and eco-design, etc.), UNEP has established new capacity in consumption issues in its Paris office with the assistance of the Dutch government;
- The Norwegian government has assisted UNEP to establish a three-year study addressing "strategies and mechanisms to promote cleaner production investments in developing countries," with initial attention to Vietnam, Nicaragua, Guatemala, Tanzania and Zimbabwe. The project is closely linked with the UNEP Financial Services Initiative (FSI).
- Progress on the pilot study to evaluate benchmarking as a cleaner production tool in the metal finishing industry was reported by a UNEP Working Group from Australia.
- All UNIDO/UNEP National Cleaner Production Centres now have operational Business Plans, after several training exercises in their preparation, and new centres have been created.

Approximately 250 people from 50 countries participated in the Korean seminar. Opening the seminar in a video message, President Kim Dae-Jung praised the success of the Cleaner Production Programme. Klaus Töpfer (UNEP's Executive Director) referred to the unrealized potential of economic instruments to shift the focus to cleaner production by making the cost of pollution more expensive than that of preventing it. He also referred to the need to better relate the goals of the Cleaner Production Programme to those of existing and emerging international conventions and protocols. The Korean Minister of Environment (Choe Jae-Wook) referred to the futility of expecting environmental problems to be solved by a few environmental policies rather than a fundamental shift in our value systems and beliefs.

The seminar concluded with ten key recommendations:

1. A need was identified for a systematic approach to the development of regional initiatives. In the previous two years, regional coordination activities for cleaner production have expanded the pioneering work of the US and Canadian Pollution Prevention Roundtable. Most recently, the Cleaner Production Roundtable of the Americas, the Cleaner Production Regional Consultative Group for Africa and the Asia-Pacific Cleaner Production Roundtable have complemented the European Roundtable and the Regional Environmental Centre based in Hungary. Participants considered this a very positive development.

The general opinion was expressed that regional "roundtables" had an important role in coor-

The Daegum performance by the Sooksun Ahn Traditional Music Group

dinating the many cleaner production initiatives developing world-wide. However, these "roundtables" in turn need coordination themselves. Without their integration in a structured programme, the potential exists for duplication and conflict.

Clear goals and strategies need to be established in a coordinated way. UNEP, as an impartial intergovernmental agency, was recommended as the appropriate body to develop these. The work of the OECD in developing "basic capacity level" in regard to cleaner production in the Central and Eastern European countries and Newly Independent States was cited as a good example to build upon. In measuring the progress of these regional institutions, participants recommended that the six most important success criteria were: engagement of local industry, leadership by local "champions", action rather than a conference and seminar orientation, exhibiting a strategic and integrative focus, recognition of local or regional priorities, and management by objective setting.

UNEP should also act as facilitator of inter-regional communication. One suggestion for achieving this was to expand the National Centres for Cleaner Production to serve the regional network as well.

It was further recommended that UNEP'S next cleaner production review seminar incorporate a "roundtable of roundtables" meeting as a central element. Currently, the regional review sessions of the cleaner production seminars only partially meet this need.

It was strongly recommended that the UNIDO/UNEP National Cleaner Production Centres and Working Groups, as well as UNEP's regional offices, play a more active role in these regional initiatives where they exist.

2. In recognition of the continuing challenge of getting the cleaner production message to more small and medium-sized enterprises, it was recommended that UNEP attempt to improve its influence on multinational companies. There is a need to encourage them to share their experiences with their suppliers and customers. The potential of making cleaner production benefits better understood through supply chain relations has only recently started to be effective. It was recognized that SMEs were too numerous to reach effectively in any way other than via "gatekeepers". The customer-supplier relations between multinationals and small-scale operators was an area of largely unrealized potential when it came to spreading the cleaner production message.

3. An area of important development where cleaner production is still missing is that of Technical Committee 207 of the International Organization for Standardization. Given the review of the ISO 14000 series on environmental management systems currently underway, it is important for UNEP to be actively involved. It was recommended that UNEP lobby to have cleaner production defined explicitly in the revision of the series and to promote it as a recommended requirement of "continual improvement". Cleaner production could provide more substantive content to the

Participants' evaluation of the seminar

A snapshot survey was carried out of participants in the Fifth High-level International Seminar on Cleaner Production. The main objectives of their participation were to share experiences, learn more about cleaner production, and obtain new materials and ideas concerning the latest developments in cleaner production. Asked whether the Korean seminar met these objectives, 73% of respondents said they had found the seminar "useful" in meeting their objectives and 20% said it had been "very useful". Of the plenary sessions, 88% found the opening session useful or very useful and 86% found the closing session useful or very useful.

The parallel sessions considered most useful to participants were those addressing cleaner production and supply chain management, cleaner production regional initiatives coordination, cleaner production financing, and implementation of the cleaner production declaration.

In response to the question whether or not they think the cleaner production approach has become more or less prominent in their own countries over the past five years, unsurprisingly all respondents indicated that it had. The reasons for this varied, however. For example, they included tighter enforcement of regulations for hazardous waste disposal (as in the United States and Indonesia), development of voluntary permitting systems (Poland) or awareness created in association with Environmental Management Systems certification (Denmark), more attention to cleaner production in education (US), increasing awareness by industry (Zimbabwe), and the development of fruitful partnerships between local government and industry (Norway and the Netherlands). A Swedish participant considered that the hotel and tourism sectors had made exceptional progress. A participant from the Netherlands noted that most Dutch companies now consider good cleaner production housekeeping to be normal business practice, while one from the Philippines remarked that companies were increasingly willing to invest in cleaner production assessments and investments.

In spite of these observations on progress, all respondents recognized that significant obstacles to cleaner production remain. Several Asian participants cited the current economic crisis as a problem. Others mentioned the lack of influence and leadership exercised by environment ministries. Lack of awareness is considered to be a continuing problem in achieving adoption of cleaner production, especially among project appraisers, bankers and local municipalities, and small and medium-sized enterprises. Some respondents felt that the enthusiasm for environmental management systems prevailing in many parts of the world detracts from the required focus on the cleaner production strategy. One noted the lack of a long-term vision for cleaner production programmes.

concept of continual improvement and give more strategic direction to an environmental management system overall.

ISO 14001 and the cleaner production strategy are widely recognized as being mutually reinforcing, yet this remains largely unrealized potential.

4. If sustainable development is to be effectively addressed, more attention to consumption and demand side issues is required alongside the predominant attention currently given to production and supply side issues. In the shift of focus from processes to products and services, a need was recognized to be mindful of the social and ethical dimensions of such a programme as well as the more technical ones. A need exists to ensure that local relevance, local solutions, and cultural diversity are key elements of the developing consumption programme.

It was recommended that UNEP pay particular attention to the marketing and advertising sectors and ensure that they are involved in the cleaner production movement. It was suggested that this was not only because of their influence on consumption behaviour, but also because of the expertise that they can bring to improving the marketing of cleaner production as a concept *per se*.

It was recommended that UNEP set up a network of interested parties on sustainable consumption and that consumption related case studies be collated. It was recommended that a working group be established on cleaner production and marketing.

5. It was generally agreed that the contribution that cleaner production can make to the implementation of existing and emerging initiatives is not being fulfilled. UNEP was urged to better promote the role that cleaner production can play in achieving the goals of, for example, the Framework Convention on Climate Change, the embryonic Chemicals Convention, the Montreal Protocol and the Basel Convention.

6. It was recommended that UNEP establish a new working group on cleaner production information collection and dissemination. The Canadian Roundtable on Pollution Prevention was recommend as an excellent host and lead agency to develop this.

7. With regard to the International Declaration on Cleaner Production, UNEP's Regional Offices and the UNIDO/UNEP National Cleaner Production Centres were encouraged to set up promotional signing ceremonies. The example of the Philippines Business for the Environment Group was used as a model for such ceremonies. UNEP was requested to develop general guidelines on these events and for the monitoring of the Declaration implementation. The NCPCs should use the Declaration as a tool in better performing the policy recommendation dimensions of their work.

8. A need for a closer relationship between the Working Groups and the NCPCs was again recommended. The NCPCs were requested to make better use of the services of the Working Groups.

9. It was recommended that UNEP concentrate on consolidating existing successes rather than embarking on any major new initiatives. Cleaner production has now moved out of its early growth phase, and the need is to ensure that initiatives that have been put in place are supported and sustained rather than that new initiatives be established which may dilute the support services available to the status quo.

10. Canada informally noted that it was investigating the possibility of hosting the next cleaner production seminar in 2000 and holding the "roundtable of regional roundtables". ✖

Launch of the International Dec laration on Cleaner Production

The Fifth International High-level Seminar on Cleaner Production witnessed the launch of the *International Declaration on Cleaner Production*. Among the inaugural signatories at the launching signing ceremony were ministers and other high-level representatives of 13 countries (14 ministries) and nine leaders of companies. By the end of the seminar, 64 signatories had acceded to the Declaration. The remainder comprised representatives of organizations such as international agencies, chambers of commerce, academic institutions and professional associations.

The ceremony generated great interest in the Declaration.

The principal purpose of the Declaration is to increase the understanding and profile of the cleaner production strategy among key decision-makers in the public and private sectors. It will also stimulate greater demand for the services of cleaner production experts.

The Declaration is a non-legally binding, but public, commitment to cleaner production as a pivotal environmental management strategy. Together with allied strategies – eco-efficiency, pollution prevention, waste minimization, etc. – it serves the goal of reorienting current unsustainable patterns of production and consumption towards more sustainable behaviour.

To many, the Declaration represents a renewed dedication to this proven win-win strategy of economic and environmental benefits; to others, it is a new commitment. But for all, it will reinforce the general recognition and endorsement of a more intense and broader adoption of cleaner production in all countries. All the signatories also commit themselves to set goals that can be measured, and to regularly review progress achieved. Because signing is just the first step, implementation of the principles set out in the Declaration indicates the real commitment. To this end, UNEP is committed to developing a global monitoring programme that will help in the process of implementation and in reviewing the progress achieved.

UNEP

INTERNATIONAL DECLARATION ON CLEANER PRODUCTION

We recognize that achieving sustainable development is a collective responsibility. Action to protect the global environment must include the adoption of improved sustainable production and consumption practices.

We believe that Cleaner Production and other preventive strategies such as Eco-efficiency, Green Productivity and Pollution Prevention are preferred options. They require the development, support and implementation of appropriate measures.

We understand Cleaner Production to be the continuous application of an integrated, preventive strategy applied to processes, products and services in pursuit of economic, social, health, safety and environmental benefits.

To this end we are committed to:

LEADERSHIP — *using our influence*
- to encourage the adoption of sustainable production and consumption practices through our relationships with stakeholders.

AWARENESS, EDUCATION AND TRAINING — *building capacity*
- by developing and conducting awareness, education and training programmes within our organization;
- by encouraging the inclusion of the concepts and principles into educational curricula at all levels.

INTEGRATION — *encouraging the integration of preventive strategies*
- into all levels of our organization;
- within environmental management systems;
- by using tools such as environmental performance evaluation, environmental accounting, and environmental impact, life cycle, and cleaner production assessments.

RESEARCH AND DEVELOPMENT — *creating innovative solutions*
- by promoting a shift of priority from end-of-pipe to preventive strategies in our research and development policies and activities;
- by supporting the development of products and services which are environmentally efficient and meet consumer needs.

COMMUNICATION — *sharing our experience*
- by fostering dialogue on the implementation of preventive strategies and informing external stakeholders about their benefits.

IMPLEMENTATION — *taking action to adopt Cleaner Production*
- by setting challenging goals and regularly reporting progress through established management policies;
- by encouraging new and additional finance and investment in preventive technology options, and promoting environmentally sound technology cooperation and transfer between countries;
- through cooperation with UNEP and other partners and stakeholders in supporting this declaration and reviewing the success of its implementation.

The Declaration will help spread awareness of actions to address current environmental problems. It will encourage better understanding of the key component activities contained within the concept.

It also represents a mechanism for various agents at regional and national levels – such as National Centres for Cleaner Production – to stimulate the interest of their own constituents in the countries where they operate. UNEP has produced a guide to assist such organizations host events to launch and monitor renewed cleaner production campaigns in their countries, using the Declaration as the focus of their attention. In this way, the intention is both to broaden geographically and to diversify the sectors adopting this preventive strategy.

The idea for a declaration on cleaner production/pollution prevention originated with a proposal by the United States Pollution Prevention Roundtable at the Oxford seminar in 1996. Eighteen months of world-wide consultations held by UNEP, and numerous drafts, resulted in the final version being ready for launching in Korea.

The final version of the Declaration achieved consensus on the six principal actions for advocates of cleaner production to undertake: using their influence with stakeholders and leadership to encourage commitment to this strategy; building capacity in regard to the strategy through awareness, education and training; encouraging the integration of the preventive concept at all levels and in all relevant aspects of environmental management; creating innovative cleaner production solutions through research and development; communicating and sharing experiences with cleaner production; and setting challenging goals and developing action plans to achieve them.

UNEP Executive Director Klaus Töpfer signing the International Declaration on Cleaner Production

In support of their decision to sign the Cleaner Production Declaration in Korea, the Vice Minister of Environment of the People's Republic of China, Wang Xinfang, added that cleaner production was now a major priority in China's Agenda 21 Action Plan. He said that over 65,000 enterprises with "backward" technologies have been closed down for persistent pollution offences. He saw the Declaration as a tool to encourage international cooperation in technological assistance and financial support.

Oh Kang-Hyun (Korea's Deputy Minister of Industry and Technology) referred to the Asian economic crisis as hampering the promotion of, and investment in, cleaner production initiatives. However, he felt that the Declaration would signal a new joint effort.

Panagian Sirigar (Indonesia's Minister of Environment) said he regarded command and control regulations as largely ineffectual in tackling environmental problems in Indonesia. The Declaration represented a tool for a more pro-active approach to managing the environment that emphasizes the incentive of economic benefits to business rather than punitive sanctions.

The Vice Minister of Environment of Moldova, Mr Alexei, and the Minster of Environment and Nuclear Safety of Ukraine, Mr Bratishko, saw the Declaration as important guidance to their young countries which would help them integrate their environmental policies closely with those of the international community.

Markus Lehni, signing on behalf of the World Business Council for Sustainable Development, offered the WBCSD's support in promoting the Declaration and reiterated the attractions of cleaner production to business owing to the business opportunities it presents.

Among the inaugural signatories, Mitsubishi Electric, Texas Industries, Samsung, Hyundai, BHP, LG Caltex, San Miguel Corporation, Yuhan Kimberley and Shri Shakti (as well as the Pakistan and Sri Lanka Chambers of Commerce) signed in Korea.

International agencies that signed included the UN Commission on Sustainable Development and the UN Industrial Development Organization (UNIDO) and the Asian Productivity Organization. They were accompanied by the Environmental Protection Authority of Victoria, Australia; the City of Bogota, Colombia; and the World Federation of Engineering Organizations.

The full current list of signatories is available on UNEP's web page (**http://www.unepie.org**). ✖

DECLARATION INTERNATIONALE POUR UNE PRODUCTION PLUS PROPRE 국제 청정생산 선언문

INTERNATIONAL DECLARATION ON CLEANER PRODUCTION Международная Декларация Более Чистого Производства

DECLARACIÓN INTERNACIONAL SOBRE PRODUCCIÓN MAS LIMPIA

DICHIARAZIONE INTERNAZIONALE SULLA CLEANER PRODUCTION 国际清洁生产宣言

Reflections on cleaner production terminology

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Abstract
Governments and industry now generally favour the preventive approach represented by cleaner production. However, new concepts and new terminology often create confusion. This article is intended to help unravel the "tangled web of terminology".

Résumé
A l'heure actuelle, les gouvernements et l'industrie choisissent généralement la démarche préventive de production plus propre. Mais les nouveaux concepts et la nouvelle terminologie créent souvent des confusions. Cet article s'efforce de démêler la « toile inextricable de la terminologie ».

Resumen
Tanto los gobiernos como el sector industrial se inclinan por el carácter preventivo que distingue a la producción más limpia. Sin embargo, los nuevos conceptos y los neologismos que los expresan suelen crear confusión. Mediante este artículo, se pretende desenredar esa "maraña terminológica".

The International Declaration on Cleaner Production launched by the United Nations Environment Programme in 1998 connects different preventive terms with preferred options for improved sustainable production. How did these terms develop?

In the 1980s, **clean technology**[1] or **low- and non-waste technology**[2] began to be widely promoted. This type of technology was often understood to consist of methods that could be used to reduce waste or pollution "at source". For instance, in the US EPA's *Waste Minimization Opportunity Assessment Manual* (1988) waste minimization initiatives were described as changes in product, input material, technology or operating practices.

A 1989 UNEP expert group defined **cleaner production** as "the conceptual and procedural approach to production that demands that all phases of the life cycle of a product or of a process should be addressed with the objective of prevention or the minimization of short- and long-term risks to humans and to the environment."

Will "cleaner production" become the commonly accepted term to describe this approach to achieving sustainability? The question is not easy to answer, as there is wide disagreement on the precise meanings of, for instance, cleaner production, **clean technology** and **pollution prevention**. These terms are frequently, but not always, used to mean the same thing. They may describe environmental improvements to process technology, or such improvements carried out with the intention of addressing a product's entire life cycle.

Two ways in which "clean technology" was defined recently in the UK are relevant to this discussion. At a governmental environmental policy level, it was described as focusing on "reducing demand of raw materials and energy and on the prevention, as distinct from the treatment or disposal, of pollution and other wastes" (ACOST, 1992). However, it was also considered (Clift, 1995) to be the means of providing "a human benefit which, overall, uses less resources and causes less environmental damage than alternative means with which it is economically competitive." According to the second definition, the human benefit of any product or service would be evaluated against the environmental impacts associated with providing it.

Approaches to reducing or eliminating waste/emissions/pollution are still evolving, and so are the terms used to describe these approaches. In 1992, UNEP's *Cleaner Production* newsletter answered the question "What is cleaner production?" as follows:

"a) Cleaner production means the continuous application of an integrated, preventive environmental strategy to both processes and products to reduce risks to humans and the environment:
b) Cleaner production techniques include conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes;
c) A cleaner production strategy for products focuses on reducing environmental impacts throughout the entire life cycle of the product – from raw material extraction to the product's ultimate disposal;
d) Cleaner production is achieved by applying expertise, improving technology and changing attitudes."

In 1994, a focus on "services" was added.

As the cleaner production concept has been disseminated world-wide, other definitions have also been proposed, e.g. a "strategy to continuously improve products, services and processes to reduce environmental impacts, and to work towards ecologically and economically sustainable development."

The OECD developed the definition, "the continuous application of an integrated prevention environmental strategy to processes and products in order to reduce risks to humans and the environment. It is also referred to as low- and non-waste technology, waste minimization, and waste reduction" (OECD, 1995).

In the 1990s, a number of terms have become increasingly familiar (although they may not always have a universally agreed meaning). They include **total cost-benefit accounting** (TCBA),[3] **zero waste**,[4] **product stewardship**,[5] **eco-efficiency**, **green twinning** and **by-product synergy**,[6] **industrial ecology**,[7] **ecological technology**,[8] **industrial metabolism**, **life cycle analysis** (LCA), **Design for Recycling** (DfR) and **Design for the Environment** (DfE),[9] and **lean production**.[10]

Thus, without attempting to define these concepts precisely, UNEP's International Declaration on Cleaner Production states that, to improve sustainable production and consumption practices

*We believe that Cleaner Production and other preventive strategies such as **Eco-efficiency**, **Green Productivity** and **Pollution Prevention** are preferred options.*

The Declaration also includes a commitment to encourage the integration of preventive strategies

*...by using tools such as **environmental performance evaluation**, **environmental accounting**, and **environmental impact, life cycle, and cleaner production assessments**.*

Many organizations and individuals have played an important role in elaborating these definitions of cleaner production and related concepts. For example, in the 1980s the Universities of Lund (Landskrona project), Amsterdam and Rotterdam (PRISMA project) began research on preventive concepts in a European context. UNEP has been working on cleaner production concepts in an international context since the 1980s. The number of concerned parties can be expected to increase in the future.

Note from the editor: The following article by

Ruihe Tu on cleaner production in China is a reminder of the importance of how these terms are used in languages other than English.

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Notes

[1] "Clean technologies are any technical measures in the various industries to reduce, or even eliminate at source, the production of any nuisance, pollution or waste, and to help save raw materials, natural resources and energy. They can be introduced either at the design stage with radical changes in the manufacturing process or into an existing process with separation and utilisation of secondary products that would otherwise be lost" (OECD, 1987).

[2] "The low polluting technology is a manufacturing method (process, plant, territorial-industrial complex) where the totality of raw material and energy is used in the most rational and integrated way in the production cycle: raw material resources – production – consumption – secondary material resources, in order to prevent any negative impact on the environment likely to affect its normal functioning. In the broad sense, the low polluting and non-waste technology concerns, not only production processes, but also the fate of products characterised by a longer lifetime and easier repair and that could be recycled and transformed after use, in order to prevent ecological damage. The aim is to obtain a complete technological cycle for the use of natural resources, compatible with or similar to natural ecosystems" (UN/ECE, 1984).

[3] Total cost accounting is designed to assist managers identify and quantify costs that are usually included in overhead and externalized costs. The concept could also cover liability aspects and cleaner production benefits. It might then be referred to as total cost-benefit accounting.

[4] This concept had already been presented in the United States in 1982. Today, interest in "zero waste" is especially keen in Asia. For several years the Zero Emissions Research Institute (ZERI) at the UN University in Japan has been organizing research and web site discussions. The food processing research division has combined its activities with those of the ICPIC working group on food processing (see *icpic@unep.fr; http://www.unepie.org/icpic/icpic.html*).

[5] Within this context, producers would be responsible for the overall life cycle of a product, including the take-back of the product at end of life.

[6] In the World Business Council for Sustainable Development (WBCSD) 1996 annual report, eco-efficiency is defined as "the production of ever more useful goods and services – in other words the adding of value while continuously reducing the consumption of resources and the creation of pollution."

The WBCSD – Gulf of Mexico Charter also uses terms such as "green twinning": "The concept of green twinning is to promote joint commercial development of one economic sector. In practice this means the waste product of one industry can be used by a second industry." Another term is "by-product synergy", which indicates use of a modified cleaner production assessment method.

[7] Industrial ecology – understood as the use of a company's waste stream by another company as its resource base – has been criticised as a barrier to innovation. However, industrial ecology can also be systems-oriented and cover a longer time frame and the whole array of natural resources management and manufacturing. The concept has raised renewed interest in industrial metabolism in the broader context of external re-use.

[8] Jansen and Vergragt (1993) assume that essential radical changes will take a two-generation time frame. For that reason they use a system of back-casting to avoid developments that would not lead to sustainability. This back-casting method presumes the possibility of developing more fundamental steps in different time frames: 25 years in the case of ecological (which will go beyond "cleaner") technology.

[9] The design of a product has an important impact on the use of natural resources and materials, and on pollution emissions. Focus on this issue increased in the 1990s with the introduction of the life cycle approach which led to general approaches like Design for Recycling and Design for the Environment.

[10] From a business economics point of view "lean production" is a restructuring process aimed at increasing profits in the long run. From an environmental perspective, lean production integrates both "lean" and "clean" management.

Promoting cleaner production in China: overview and outlook

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Abstract

This article reviews China's cleaner production practices; summarizes the policies and activities of the central and local governments and of international cooperative activities; analyses progress already made in regard to promoting cleaner production; and discusses the challenges that remain. Ten recommendations are made for achieving wider adoption of cleaner production in China.

Résumé

L'article passe en revue les pratiques de production plus propre adoptées en Chine ; résume les politiques et activités des autorités centrales et des collectivités locales, ainsi que les activités de coopération internationale ; analyse les progrès accomplis en matière de promotion de la production plus propre ; examine les obstacles qui restent à surmonter. Dix recommandations sont faites pour généraliser l'adoption de la production plus propre en Chine.

Resumen

Este artículo estudia las prácticas de producción más limpia en China. Ofrece un compendio de las líneas directrices y las actividades del gobierno central y las jurisdicciones locales, así como de las actividades internacionales de cooperación, además de analizar los progresos logrados en la promoción de la producción más limpia y los obstáculos que quedan por salvar. Incluye diez recomendaciones para difundir la puesta en práctica de la producción más limpia en China.

**At the time this article was written, Mr Ruihe Tu was seconded to the UNEP Division of Technology, Industry and Economics by the State Environmental Protection Administration of China.*

Introduction

"Cleaner production" is a general term used to describe a preventive environmental strategy for industrial production that aims to reduce risks to human health and the environment. The concept originated in Europe during the 1970s, in an effort to promote "low- and no-waste" technologies. Similar ideas and concepts such as pollution prevention, clean technology, eco-efficiency, green manufacturing, environmentally conscious manufacturing, and waste minimization also exist.

Cleaner production is a strategy and an approach via which industry reaches the goal of sustainable development. Implementing cleaner production can minimize or eliminate the need for trade-offs between economic growth and the environment, between worker safety and productivity, or between consumer safety and competitiveness in international markets. Reconciling several goals at the same time leads to "win-win" situations. Cleaner production is a "win-win" strategy: it protects the environment, workers and consumers while improving industrial efficiency, profitability and competitiveness.

Cleaner production is especially important for developing countries like China that are rapidly expanding their industrial production. It presents an opportunity for developing countries to invest relatively cheaply in cleaner production now rather than paying heavily later for clean-up operations, as has been the case in most industrialized countries. In other words, implementing cleaner production avoids the traditional approach of "pollute now and clean up later".

There is every reason to believe that the lessons learned from the experiences of industrialized countries make it possible for developing countries to avoid the long learning curve associated with industrial pollution abatement. However, the adoption of cleaner production practices has proved to be painstaking even if ultimately rewarding.

China's industrial pollution management policies went through two stages before getting to the third stage of focusing on pollution. The *first stage* covers the years 1973-1978. This was the period in which environmental protection began in China. Industrial pollution control focused on individual point sources. Although some basic principles such as "Comprehensive Utilization of Three Wastes" (waste water, solid waste and off-gas) and "Transforming Wastes into Resources" were proposed, the main approach focused on end-of-pipe treatment. Serious local pollution was reduced to some extent, but energy and natural resources continued to be wasted and overall environmental quality was getting worse.

The *second stage* is the period 1978-1992. The strategy of integrated prevention and control was proposed and implemented. The guiding principles or strategies developed between the late 1970s and the mid 1980s included the "Three Simultaneous Steps" and the "Three Unifications". Later on, these two guiding principles were integrated into one guiding principle or strategy called "Reconciling Environment and Economy". The three national environmental policies developed and implemented during the same period were: 1) "Polluter Pays", 2) "Prevention First; Integration of Prevention and Control", and 3) "Strengthen Environmental Supervision and Management".

The *third stage* started in 1992, when new strategies for industrial pollution control were initiated. The milestone was the Second National Conference on Industrial Pollution Prevention and Control in 1993, at which the Chinese government announced its new policies for abating industrial pollution. These were summarized as "three shifts":

- a shift from end-of-pipe control to whole process prevention and control and waste reduction at the source (cleaner production);
- a shift from controlling pollutants' concentration to integrated control of both concentrations and total pollution load (total emissions); and
- a shift from decentralized control of individual point sources to the integration of individual source control with centralized treatment of pollutants.

Although the shift in policy orientation began the journey towards cleaner and more sustainable production, changing government and industry practices in a country as large as China takes some time. Numerous efforts have been made to speed up the process. It is now the moment to examine progress, identify new challenges, create synergies among various initiatives and move forward more rapidly.

Promoting cleaner production in China: what has been done

Cleaner production practices before the 1990s

Although the new term "cleaner production" was introduced in the 1990s, some cleaner production-related ideas and initiatives existed in China before then.

Several cleaner production principles were proposed in the early 1980s, at the time China developed its "Prevention First" policy. Theoretical cleaner production concepts were also indicated in the 1983 State Council Decision on Integration of Industrial Pollution Prevention and

Table 1
Government policies and action plans for cleaner production

Year	Agencies/organizations	Activities/policies/plans
1992	NEPA[2] World Bank UNEP	Preparation of Subproject B-4, "Promotion of Cleaner Production in China" in the framework of the World Bank's "Environmental Technical Assistance Project".
	State Council	Ten National Policies on Environment and Development approved. Sustainable Development Strategy proposed. For industrial pollution control, "new and renovation development projects, clean processes which produce less pollutants and have higher energy efficiency should be applied."
	NEPA	China's first international workshop on cleaner production held in Xiamen in May.
1993	NEPA SETC[3]	Strategic shifting from end-of-pipe pollution control to pollution prevention proposed and cleaner production identified as "a strategic measure for industrial pollution control" at the Second National Conference on Industrial Pollution.
1994	State Council	Promotion of cleaner production listed as one of the nine top priorities in China's Agenda 21.
	State Council	Two major decisions made: to develop a market-oriented economy by shifting economic planning, and to shift the economic development and growth mode.
	State Council	One of two national strategies approved by the State Council is to implement a Sustainable Development Strategy.
1996	State Council	Promotion of cleaner production highlighted at the 4th National General Conference on Environmental Protection and in the State Council Decisions on Environmental Protection Issues approved in August.
	State Council	Cleaner production identified as a strategic measure for achieving the 9th National Five-year Plan and the Long-Term Targets for 2010 for Environmental Protection.
	CCICED[4]	Working Group on Cleaner Production established.
1997	NEPA	Policy Suggestions and Action Plans for Promotion of Cleaner Production issued in NEPA's Administrative Document N° [1997] 232 in April. Summary: 1) Cleaner production assessments should be conducted for major polluting enterprises in three river basins (Huaihe, Haihe and Liaohe), three lake basins (Taihu, Dianchi and Chaohu) and two control regions (one for acid rain and the other for SO_2); 2) Cleaner production should be integrated into overall business management of enterprises; 3) Cleaner production should be integrated into existing environmental regulations or instruments: EIA should include cleaner production assessment; cleaner production assessment should be included in the procedures of permitting; cleaner production assessment should be conducted for those enterprises ordered to control their pollution before deadline; 4) cleaner production and life cycle assessment should be introduced in the process of issuing eco-labels to products.
	NEPA	Development of cleaner production technologies listed as one of ten top priorities for R&D in NEPA's 9th Five-year Environmental R&D Plans.

Control into Technology Renovation: "Pollution should be eliminated in the production process through: 1) substituting backward technologies with advanced technologies which generate less waste; 2) increasing the efficiency of resource and energy use; 3) using equipment and facilities which generate less pollution, or consume less resources and energy, than those which cause heavy pollution or consume more resources and energy; 4) substituting hazardous and toxic raw materials with less toxic and less hazardous materials; 5) developing new products which are more environmentally friendly, with no pollution or less pollution."

Cleaner production practices were encouraged in the 1989 PRC Law on Environmental Protection: "For new enterprises to be developed, or those existing enterprises under technology renovation, equipment and processes with more efficient resource use and generating less waste should be installed."

Practices such as comprehensive utilization of industrial waste, reduction of industrial waste through upgrading of technologies, clean factory campaigns, and a manager's responsibility system for environmental protection are among early examples of cleaner production initiatives. However, until 1992, when UNEP and the World Bank formally introduced the cleaner production concept into China, preventive pollution management was not systematically understood and implemented.

Government cleaner production policies and action plans

For a list of these, see Table 1.

Legislation relevant to cleaner production

China does not have a specific law or act concerning cleaner production at present. However, cleaner production is encouraged in concrete environmental laws approved in the 1990s (Table 2).

Capacity building and institutional development for cleaner production

The China National Cleaner Production Centre

In December 1994, the China National Cleaner Production Centre (CNCPC) was created by NEPA within the Chinese Research Academy of Environmental Sciences (CRAES) in Beijing, with assistance from the UNEP/UNIDO National Cleaner Production Centre programme. CNCPC created its Sub-centre for Education and Training within Tshinghua (Qinhua) University in Beijing.

CNCPC is a technical support institution on cleaner production for China's State Environmental Protection Administration (SEPA) and is guiding local environmental protection bureaus (EPBs) in the development of their cleaner production programmes. CNCPC offers cleaner production training courses both domestically and internationally.

Local and sectoral cleaner production centres

By the end of 1997, ten provincial or municipal cleaner production centres had been created in Shanghai, Tianjin, Shaanxi, Inner Mongolia, Jiangxi, Heilongjiang, Changsha, Huhehaote, Shandong and Liaoning. There were five sectoral cleaner production centres in the chemical, petrochemical, metallurgical/iron and steel, aviation and shipping industries. In addition, cleaner production promotion offices or cleaner production steering groups had been organized in some local EPBs.

National Cleaner Production Network

A National Cleaner Production Network was established in December 1996. The members include cleaner production centres, cleaner production promotion offices of local EPBs, and companies with cleaner production activities. The Secretariat for coordinating the Network is within CNCPC. The Network's goal is to exchange information and experience on the promotion of cleaner production. By June 1998, the Network had 80 members.

Cleaner production newsletters

The Secretariat of the Network periodically publishes its own cleaner production newsletter in Chinese and organizes an annual meeting at which participants exchange cleaner production information, including successes and lessons learned. Moreover, the newsletter of UNEP's Cleaner Production Programme is translated into Chinese and distributed in China.

Cleaner production manuals and guidelines

The following cleaner production manuals have been published in Chinese:

- *Cleaner Production Audit Manual for Enterprises;*
- *Guide for Cleaner Production in the Pulp and Paper Industry;*
- *Guide for Cleaner Production in the Brewing Industry;*
- *Guide for Cleaner Production in the Organic Chemical Raw Materials Industry;*
- *Guide for Cleaner Production in the Electroplating Industry.*

Table 2
Legislation relevant to cleaner production

Year	Passed by	Laws/regulations
1995	NPC[5]	PRC Law on Air Pollution Prevention and Control, Article 15: In order to reduce the generation of air pollutants, enterprises should give priority to adopting cleaner production technology which has higher energy efficiency and generates less wastes.
	NPC	PRC Law on Solid Waste Prevention and Control, Article 4: The State encourages and supports cleaner production to reduce the generation of solid wastes.
1996	NPC	PRC Law on Water Pollution Prevention and Control, Article 22: Enterprises should adopt cleaner production technology which has higher efficiency of resources use and generates a smaller quantity of pollutants, and should strengthen housekeeping to reduce generation of pollutants.
1998	NPC	PRC Law on Energy Saving effective on 1 January 1998. Several programmes will be set up according to this law: development of energy consumption upper limits per unit of production, phasing out of outdated products and equipment with too high energy consumption, and energy-saving labelling.

◆ *Guide for Cleaner Production in the Silk Dyeing and Printing Industry.*

Training

It is estimated that about 380 cleaner production auditors have been intensively trained. Dozens of cleaner production training workshops or promotional meetings have been organized. The Training Kit for the *Cleaner Production Audit Manual for Enterprises* has been published in Chinese.

Cleaner production assessments, economic and environmental benefits

According to incomplete statistics, cleaner production assessments had been carried out in more than 200 companies in various cities and provinces by the end of 1997.

Remarkable economic and environmental benefits have been realized by implementing cleaner production options, and a total of 500 million RMB Yuan was saved. Waste water reduction amounted to 13 million tonnes. Air pollution was reduced by 800 million m^3. An annual total reduction of 80 thousand tonnes of solid waste was achieved in the 219 companies where cleaner production assessment had been conducted and cleaner production options had been implemented.

Bilateral and multilateral cleaner production activities

Brief summaries of major projects are given in Table 3.

Cleaner production activities in provinces and cities

Beijing

Twenty-six pilot companies had implemented cleaner production options before the end of 1995. Another 26 companies were listed in the Beijing EPB's 1996-1997 demonstration plan. The plan covered the brewing, chemical, pulp and paper, machinery, printing and dyeing, electronic, electroplating, pharmaceutical and telecommunications sectors. A cleaner production promotional office was created in the Beijing EPB.

Shaanxi

The Provincial Cleaner Production Centre was created by the Provincial EPB as part of a five-year cleaner production action plan. Workshops and training courses have been organized. The Provincial Government issued its own cleaner production policies, based on the 1997 NEPA's Administrative Document N° 332. Specifications were made concerning applications for pollution control funding. Enterprises applying for the fund are obliged to implement cleaner production assessment and cleaner production options.[15]

Heilongjiang

Thirteen pilot and demonstration projects were completed at the end of 1996 in the brewing, chemical, building materials and wood products sectors. The Provincial Cleaner Production Centre was created in May 1996.

Benxi City

In Benxi City, Liaoning Province, substantial cleaner production activities will be jointly conducted by local government and the European Union. One UNDP-financed cleaner production project is being implemented, focusing on improving municipal capacity for protecting air quality. Under this UNDP project, a municipal cleaner production centre is being established. The municipal government has developed an action plan for promoting cleaner production and has set a target of conducting cleaner production assessment in 500 enterprises by the year 2000. Policies concerning financial incentives for implementing cleaner production have been developed by the city government.

Cleaner production activities in industrial sectors

Chemical industry

The Cleaner Production Technology Centre for the Chemical Industry has been created in Beijing. Cleaner production was recognized as the strategic pollution control measure in the chemical industry at the 7th National Environmental Protection Conference for the Chemical Industry in 1994. A draft action plan for implementing cleaner production in the industry up to the year 2000 has been proposed.

Petrochemical industry

The Cleaner Production Technology Centre for the Petrochemical Industry has also been created in Beijing. In its action plan, cleaner production is required at 85% of major facilities by the year 2000.

Other industries

There are also cleaner production activities in the ship building and shipping, aviation, iron and steel, light industry and building materials sectors.

Wide adoption of cleaner production: remaining challenges

Barriers due to low environmental awareness and misconceptions about cleaner production

The low level of public understanding of environmental problems leads to very weak support for implementation of cleaner production. A survey of environmental awareness conducted not long ago showed that the public's understanding of and participation in environmental protection are inadequate for the tasks that we are facing in China. As Qu Geping has written, "Raising the environmental awareness of the public and various leaders/decision-makers in particular is the basic prerequisite for doing a good job in environmental protection in China."[16]

Low environmental awareness among decision-makers could be one of the major barriers to promotion of cleaner production. One of the typical misconceptions among plant managers is that an environmentally sound project will always cost more. Although many success stories in China have demonstrated the win-win situation that implementing cleaner production can bring about, plant managers are not easily convinced. To government departments at various levels, environmental protection is seen as the responsibility of EPBs and SEPAs. When government decision-makers have to resolve short-term conflicts between development and environment, immediate economic benefits are too often given priority over cleaner production and environmental protection.

The real problem behind all this lack of interest in implementing cleaner production is a misunderstanding of the relationship between development and environment. One issue raised by both industry authorities and government environmental authorities (GEAs) is that conditions are not favourable for China to promote cleaner production, since it is a developing country with an undeveloped economy and backward technologies. Development clearly comes first, and environment second, in the minds of a good many decision-makers. Only when cleaner production is seen by decision-makers at all levels and in all departments of government and industry as the right strategy for sustainable development will it be adopted widely in China.

If we go one step further and ask the question "Why is cleaner production not yet widely understood in China after seven years of hard effort?", we will have to look at the way the cleaner production concept has been introduced. Knowing how to introduce it to different people with different backgrounds and knowledge levels is a real challenge. For example, the original Chinese translation of "cleaner production" is *Qing Jie Sheng Chan*, which omits the English comparative

"er" and so becomes "clean production". To a worker on the shop floor, the obvious meaning is to keep the floor clean during production. This translation also caused disagreement among environmental professionals on what is considered "clean" and what the cleaner production standards and indicators should be.

The strategy for introducing cleaner production in China also needs to be examined. Emphasis has been given to the technical content of cleaner production, which largely involves cleaner production assessment. This is important, since pilot projects will not obtain the desired result without technical know-how, but cleaner production is not just a methodology and management tool. To influence decision-makers, it should be seen as a strategy and placed in the context of development.

A lot should be done in regard to raising the environmental and cleaner production awareness of both the public and China's leaders/decision-makers. A comprehensive campaign for educating industry and environmental regulators should be initiated.

Challenges associated with institutional issues

The influence that local government and SEPA have over local environmental protection authorities is unbalanced. Although provincial, municipal and county EPBs are under the leadership of both local government and SEPA, the leadership of SEPA is realized through guidance and policies while local government control is extended to appointing directors, staff recruitment and funding. It is necessary to strengthen SEPA's influence over local EPBs, so that they can function better in terms of monitoring, supervision and enforcement of environmental policies, laws and regulations, with greater support from SEPA.

The roles of various stakeholders in promoting cleaner production are not well understood. It has been commonly understood that promoting cleaner production is the responsibility of environmental authorities. It is necessary to define the roles and responsibilities of GEAs, industrial authorities, individual companies and other stakeholders in the promotion of cleaner production.

Channels for promoting cleaner production in sectoral industries need to be smoothed. How to integrate environmental considerations into the decision-making process of economic, social development and regional development policies and plans is a great challenge not only in China, but in all countries. There is a great need for SEPA to work closely with industrial authorities on promoting cleaner production. With the restructuring of government departments in March 1998, it seems that all power and authority related to industry go to the State Economic and Trade Commission (SETC), which could be SEPA's main partner in promoting cleaner production in industry.

Challenges associated with environmental policies, laws and regulatory systems

Cleaner production fits well in the framework of those national development and economic strategies based on "Implementing Sustainable Development Strategy", implementing China's Agenda 21, "Developing a Market-oriented Economic System" and "Shifting the Economic Growth Mode". But these development and economic strategies are relatively new. The challenge is how to implement them.

Cleaner production and pollution prevention fit very well in the framework of environmental policies and strategies, particularly the guiding principle of "Reconciling the Environment and Economy" and the policies of "Prevention First", "Integration of Prevention and Control" and "Strengthening Environmental Regulation and Management". Encouragement of cleaner production was reflected in environmental laws approved or revised after 1990. However, the structure of these laws is still based on an end-of-pipe approach. On the other hand, media-specific laws do not encourage cross-media waste reduction. It could therefore be useful to review the current set of laws and suggest amendments to fully promote cleaner production.

Environmental regulatory instruments (ERIs) are the operational procedures used to regulate some specific issues. They include environmental tools (such as environmental impact assessment), but ERIs in China are specified in environmental laws. These environmental regulatory instruments, developed during the 1980s, are generally still predominantly end-of-pipe dominant regulatory instruments.

Table 3
Bilateral and multilateral cleaner production activities

International agencies	Domestic agencies	Name of project	Period
World Bank UNEP	NEPA, CNCPA, local EPBs	B-4: Promotion of Cleaner Production in China	93-96
World Bank	NEPA, Ministry of the Chemical Industry	B-9-1: Study on Pollution Control in the Chemical Industry	94-96
World Bank	State Poverty Reduction Administration Office, CNCPC, local government	Cleaner Production Component in Southwest Poverty Reduction Project	95-98
World Bank	State Poverty Reduction Administration Office, CNCPC, local government	Cleaner Production Component in Qing-Ba Regional Poverty Reduction Project	96-99
UNEP, UNIDO	NEPA	China National Production Centre Project	94-98
UNEP, SIDA[6]	NEPA, CNCPC, National Council of Light Industry	Cleaner Production Demonstration Project in the Pulp and Paper Industry (Phase I & II)	95-97
US EPA, Illinois EPA, World Bank, UNEP	NEPA, CNCPC, industrial authorities	Promotion of International Pollution Prevention Technology in China	95-96
US EPA	SEPA	High-Level International Seminar on Cleaner Production	Nov. 98
NORAD,[7] NIF[8]	MOST,[9] Beijing EPB	Sino-Norwegian Cooperative Programme on Cleaner Production (Phase I)	94-95
NORAD, NIF	MOST, Beijing EPB	Sino-Norwegian Cooperative Programme on Cleaner Production (Phase II)	98-99
Australian EPA, ACCP[10]	NEPA, CNCPC	China-Australia Cooperation Programme on Cleaner Production	June 96
British ODA[11]	Shanghai EPB	Cleaner Production Component in Shanghai Urban Reconstruction Project financed by the UK Government	95-98
CIDA[12]	SETC, SEPA, Ministry of the Chemical Industry, National Council of Light Industry	China-Canada Cooperation on Cleaner Production	97-2000
European Commission, UNEP	MOFTEC,[13] SEPA, Liaoning provincial and municipal governments	Cleaner Production Component in the China-EU Liaoning Integrated Environmental Programme	98-2002
UNDP	CICETE,[14] MOFTEC, Benxi Agenda 21 Centre, CNCPA	Capacity Building for Widespread Adoption of Cleaner Production for Air Pollution Control in Benxi	97-99

The main barriers to promoting cleaner production in these ERIs could be reviewed, and amendments suggested to promote an integrated cleaner production approach. More work needs to be done to incorporate cleaner production strategies into these instruments, so that incentives can be created for industries to implement cleaner production. This is also an area in which local government can develop policy options concerning the local situation before the nation-wide system is modified and improved.

Challenges also exist in regard to weak enforcement of environmental laws and regulatory instruments. In general, weak enforcement might diminish the pressure on companies to reduce their pollution, which results in there being no driving force for the companies to introduce cleaner production, or even to comply with emissions standards. Comprehensive enforcement policies should be redefined, involving redesign and training of environmental inspectors.

Challenges associated with industrial and financial policies

Barriers associated with industrial policies

Since China started to protect the environment in the early 1970s, efforts have gradually been made to integrate pollution control into technology renovation and industrial policies. In the process of developing policies for technology renovation,

a number of measures have been identified, including the strengthening of management and good housekeeping. However, industrial development policies have focused on quantitative growth and growth in scale, and environmental protection efforts have concentrated on ways to meet emission standards. Thus, too much attention has been given to end-of-pipe solutions, and options to reduce the generation of pollutants at various stages of production have been ignored. Again, focusing on end-of-pipe control is the main barrier in regard to industrial policies.

Challenges associated with lending and credit policies

In 1995, the People's Bank of China, China's central bank, issued an administrative document (N° Yin Fa 1995-24) requiring various banking institutions to implement environmental laws and policies in their credit and lending operations. The credit and lending policies set out in this document provide a supportive atmosphere for environmental protection, including the promotion of cleaner production. Banking institutions are required to have positive lending policies regarding projects which could reduce pollution and generate obvious economic benefits.

The challenge is how to push projects which implement cleaner production options into the lending channel of banking institutions. Operators in banking institutions should be given training related to cleaner production.

Internal barriers to introducing cleaner production within enterprises

From the point of view of government and environmental agencies, there are sufficient reasons to introduce cleaner production. But while enterprises are the major targets for implementing cleaner production, there is inadequate discussion of why they should adopt cleaner production from the point of view of entrepreneurs. The following describes major internal barriers to the promotion of cleaner production within enterprises. However, it should be noted that internal barriers are normally interrelated with external barriers, and that some of these barriers are mutually reinforcing. Barriers to introducing cleaner production may be due to:

- *Low environmental awareness.* Enterprises' public image could be damaged by poor environmental performance. Nevertheless, owing to low environmental awareness, they are not concerned with their environmental image and may even have a resistant attitude to environmental laws and regulations. For the same reason, company managers would prefer to keep environmental affairs off their business and operations agenda, thus reducing the potential benefits cleaner production could bring.
- *Inappropriate internal organization.* According to the PRC Law on Environmental Protection, organizations that generate environmental pollution should integrate environmental protection into business planning and establish an environmental responsibility system. In practice, such a system often exists only in name or on paper. Furthermore, people consider that it is the responsibility of one identified person and that no one else is relevant. This is another way in which environmental concerns are kept off managers' agendas.
- *Poor management and technical capabilities.* Many managers in small companies are unfamiliar with modern management practices and technologies. They know little or nothing about cleaner production and are not aware of its potential associated benefits. In township and village enterprises (TVEs), inefficiency and poor management are often made worse through the use of backward, obsolete equipment and technologies. Use of such equipment and technologies in some TVEs is related to their limited financial capacities. However, case studies have shown that in some TVEs the staff's gaps in basic technical knowledge and lack of formal technical training prevented them from adopting many of the cleaner production options.
- *Lack of appropriate information concerning cleaner production technologies.* Difficulties in obtaining information on cleaner production technologies prevent managers from understanding the benefits of implementing cleaner production. Sometimes they are afraid that environmental measures related to processes and products will affect the quality of the products.
- *Lack of funding for implementing cleaner production options.* At present in State-owned enterprises, there is a high ratio of liabilities to assets. Therefore, adequate self-controlled funds are generally unavailable. Moreover, depreciation rates for industrial fixed assets are low and funds for replacing equipment are insufficient.
- *Lack of mechanisms for encouraging renovations and offering financial rewards.* Most State-owned companies are able to provide little incentive for realizing cost savings. Yet cost savings due to implementing cleaner production may not in themselves be an adequate reward for managers or initiators.

In conclusion, an internal mechanism should be developed to overcome barriers within companies.

Recommendations for achieving cleaner production in China

These recommendations are made in order to raise key issues which the author believes the environmental authorities (for instance SEPA) can address.

Foreign bilateral or multilateral aid agencies could assist Chinese environmental authorities with awareness raising programmes, capacity building, development of an information and technology services network, incorporation of cleaner production into education and training programmes and curricula, and the introduction of newer environmental management tools.

Recommendation 1: *Comprehensive national, provincial and municipal environmental and cleaner production awareness raising programmes should be developed in order to create strong demand for cleaner production.*

- An environmental and cleaner production awareness raising programme for economic, sectoral and regional development policy makers at various governmental levels

Key elements in this programme: (1) the relationship between environment and development; (2) what is sustainable development?; (3) environmental protection as one of the State's basic policies; (4) integration of environmental considerations into the economic, sectoral and regional policy-making process; (5) benefits of cleaner production; (6) cleaner production in the framework of State macro-economic development policies and strategies.

- A cleaner production awareness raising programme for environmental regulators at various governmental levels

Key elements: (1) a cleaner production strategy; (2) the benefits of cleaner production; (3) integration of cleaner production into environmental laws and regulations, regulatory instruments and other environmental programmes and action plans.

- An environmental and cleaner production awareness raising programme for industries and company managers

Key elements: (1) compliance with environmental laws and regulations at company level; (2) company-level benefits of cleaner production.

- Environmental and cleaner production awareness raising for financial and banking institutions

Key elements: (1) integration of environmental considerations into their operations to enhance respect for environmental laws and regulations; (2) benefits of cleaner production: good business for investment.

- Cleaner production awareness programme for the general public

This is part of the overall environmental awareness programme for the general public. The key elements are making the benefits of cleaner production known to society as a whole, obtaining public support for cleaner production, and putting pressure on companies to implement cleaner production.

The approaches used in various awareness raising programmes include use of television, radio, newspapers, magazines, posters, videos, meetings, seminars and workshops.

A good selection of successful examples of cleaner production is quite important for these awareness raising programmes.

Chinese environmental authorities may seek international cooperation in designing and implementing these programmes.

Recommendation 2: *The current set of environmental laws and regulations should be reviewed and amendments suggested to promote an integrated cleaner production approach, in order for companies to have to implement a cleaner production strategy as a mandatory requirement. The top priority is to integrate cleaner production into the existing environmental regulatory instruments, since most of them have been effectively enforced.*

- Integration of cleaner production into environmental impact assessment (EIA) and "Three Simultaneous Steps"

Integration of cleaner production into EIA procedures requires that some kind of initial environmental evaluation be conducted in the project identification (or project proposal) phase, and that the evaluation result in a better selection of avai-

lable technologies and processes as well as opportunities for eliminating toxic raw materials.

Methodologies for cleaner production assessment should be integrated into full-scale EIA, to maximize opportunities for energy and raw material savings and reduce the quantity and toxicity of all emissions and wastes.

The recommended cleaner production options should be implemented in the various phases of the project cycle ("Three Simultaneous Steps").

♦ Revision of policies concerning pollution charges, so as to create economic pressure to adopt and fund cleaner production

The Chinese government is reforming its policies on pollution charges. In regard to promotion of cleaner production, attention should be paid to collecting and using the charges levied.

The first priority is to increase the overall level of these charges. They should be substantially higher than control and disposal costs, thus putting economic pressure on companies to take active environmental measures in order to increase their own economic benefits (by paying less in charges).

A shift needs to occur from the "single pollutant calculation" approach to the "total amount control of multi-pollutants" approach, whether or not discharges are in excess of emission standards. Use of the "single pollutant calculation" approach leads to end-of-pipe solutions focused on a single pollutant rather than more effective integrated measures.

Policies for the use of revenue from charges should be revised to encourage companies to adopt cleaner production options rather than resorting to end-of-pipe solutions. This could be done by requiring cleaner production assessments as a precondition before a company can apply for no-interest loans from the Special Fund for Environmental Protection (which is collected by allocating part of pollution charges). The cost of conducting the cleaner production assessment could be included in the amount of the loan. Regarding use of the Special Fund for environmental purposes, investment priority should be given to implementation of the cleaner production options recommended by the cleaner production assessment.

Considering the limited size of the Special Fund for Environmental Protection, it should be used to support pilot and demonstration cleaner production programmes.

♦ Integration of cleaner production into the "Responsibility for Environmental Targets"

An indicator for implementing cleaner production should be developed as part of the "Responsibility for Environmental Targets". Either the total number or the percentage of companies with cleaner production programmes should be a target to be included in overall target-setting for local governments; consumption of energy and raw materials, and emissions per unit of production, could be targets to be included in the overall target-setting for companies.

♦ Integration of cleaner production into the procedures for "Setting a Timetable for Pollution Control"

This could be done by conducting cleaner production assessments in all companies that had been ordered to control pollution before a deadline, in order to optimize pollution reduction solutions. Priority for no-interest loans from the Special Fund for Environmental Protection should be given to implementation of cleaner production options.

♦ Integration of cleaner production into procedures for issuing a "Permit for Pollution Discharge"

A cleaner production assessment should be required if a company is going to apply for a pollution discharge permit. The total amount of emissions allowed should be based on the results of pollution reduction after the cleaner production options have been implemented.

♦ Integration of cleaner production into "Comprehensive Renovation and Quantitative Evaluation for Environmental Quality in Cities"

An indicator for implementation of cleaner production in cities could be included in the set of pollution control indicators. Either the total number or the percentage of companies in a city that have cleaner production programmes could be an indicator.

Recommendation 3: *There should be strong links between promotion of cleaner production and the environmental programmes created recently. Included are programmes on: "Promotion of Best Technologies for Environmental Protection", "Certification of Environmental Protection Products", "Environmental Labelling", "Promotion of EMS/ISO 14000" and "Model Cities for Environmental Protection".*

♦ Shifting from screening only end-of-pipe technologies to screening technologies for both cleaner production and end-of-pipe control should be made part of the programme on "Promotion of Best Technologies for Environmental Protection".

♦ Identification of cleaner production equipment and facilities should be included in the procedures for issuing a "Certificate for Environmental Protection Products".

♦ Procedures for "Environmental Labelling" of products to consider environmental impacts of manufacturing the products and results of the life cycle assessment

A cleaner production assessment should be carried out and cleaner production options implemented in a company that wants to use an environmental label on its products.

♦ Use of promotion of EMS/ISO 14000 to support promotion of cleaner production

Companies wishing to obtain EMS/14001 certification should have cleaner production assessments carried out and implement cleaner production options.

♦ Inclusion of an indicator for promotion of cleaner production among the indicators for evaluating "Model Cities for Environmental Protection"

Either the total number or the percentage of companies in a city that have cleaner production programmes could be an indicator.

Recommendation 4: *Strengthen capacity building of regional and sectoral cleaner production centres.*

♦ Training of more cleaner production auditors

Considering the size of the country and the number of companies in China, more cleaner production auditors should be trained using a train-the-trainers approach. Dozens of trainers should be trained extensively. These new trainers would then be able to train others. A national train-the-trainers programme should be developed to cover the provinces located in the "three river basins", "three lake basins" and SO_2 and acid rain control regions, as well as provincial capitals, economic zones, coastal open cities and cities of major importance for tourism. Provincial environmental protection bureaus (EPBs) could develop their own training-the-trainers programmes.

Training-the-trainers should be conducted on an industrial sector basis, since the technologies and processes used in various sectors differ.

♦ Development of more practical cleaner production training materials and cleaner production assessment guides for industrial sectors

The training materials should be prepared according to China's specific needs. Cleaner production assessment guides should be practical and incorporate case studies.

♦ Strengthening of existing cleaner production centres that function as "catalysts" and development of more regional and sectoral centres in order to form a network

Existing cleaner production centres have been involved in awareness raising, training, pilots and demonstrations. Their capacities in terms of cleaner production policy assistance to SEPA and local EPBs, cleaner production assessments, and cleaner production information and technology services should be strengthened. These centres need more technology/process engineers, who should be trained on how to conduct cleaner production assessments since these assessments are more process-oriented.

In view of its size, China needs more regional (provincial and municipal) and sectoral cleaner production centres. Regional cleaner production centres, normally under the administration of local EPBs, should orient their efforts towards awareness raising, training and policy assistance. Sectoral cleaner production centres, normally under the administration of sectoral authorities, could be involved in sector-oriented activities. Sectoral authorities are advised to build their sectoral centres within institutions that are more involved in sectoral technology/process activities and then train staff in environmental protection and cleaner production.

All the cleaner production centres should be networked to exchange information and share expertise, experiences and lessons in regard to promoting cleaner production. Regional or sectoral sub-networks may be developed as needed. They should also be linked to the international cleaner production network.

♦ The China National Cleaner Production Centre can play a key role in capacity building. Foreign bilateral or multilateral aid agencies could assist Chinese authorities in cleaner production capacity building.

Recommendation 5: *Development of an information and technology service network for cleaner production.*

♦ Regional and sectoral cleaner production centres should network other research institutions and

universities in order to provide cleaner production information and technology services to companies. Each centre could function as a cleaner production information clearinghouse.

• The network for cleaner production information and technology services should cover different sectors and regions. Special attention should be given to the needs of small and medium companies (e.g. township and village enterprises, or TVEs).

• It will be necessary to demonstrate how the information and technology service network for cleaner production can function at local level.

Recommendation 6: *National, local and sectoral research and development programmes should include initiatives for the development and promotion of cleaner production technologies.*

• Many existing cleaner production technologies are available in China, and they should be widely applied. The question is how to identify, screen and promote them. To this end, coordination between various partners such SEPA, the Ministry of Science and Technology, the State Economic and Trade Commission (SETC) and industrial authorities is essential.

• Importing foreign advanced technologies is one way to update cleaner production technologies. From a long-term point of view, it is vital for China to improve its own mechanism for investing in the development of cleaner production technologies. All national, local and sectoral research and development should incorporate the development of cleaner production technologies. Better linkages should be created between research institutes and industries.

• The shift from State funding of the development of cleaner production technologies to funding by industrial sectors and companies should occur in accordance with the shaping of the market-oriented economic system.

Recommendation 7: *Strong linkages should be created between SEPA and SETC, the government agency with the authority to coordinate efforts to promote cleaner production in industry.*

• Environmental considerations and the promotion of cleaner production should be integrated into State policies for industrial development, industrial restructuring, and extension or updating of existing facilities.

• Targets for promotion of cleaner production should be included in sectoral development plans.

• An indicator for promotion of cleaner production (such as energy and raw material consumption, or amount of emissions and waste per unit of output) should be included in the evaluation procedures for companies' economic performance.

Recommendation 8: *Orient lending and credit policies towards investment in cleaner production, and develop specific financial policies for promoting investments in cleaner production.*

• Banking and financial institutions in China are required to respect environmental laws and regulations in their credit and lending operations, and to have positive lending policies for projects that can reduce pollution and generate obvious economic benefits. New investments need to be directed towards cleaner production in China. Financial institutions need to be convinced of the business potential of investments in cleaner production. And specific financial policies aimed at promoting investments in cleaner production should be developed.

UNEP, with funding from the Norwegian government, is implementing a project on "Strategies and Mechanism for Promoting Cleaner Production Investments in Developing Countries".[17] The project will demonstrate how cleaner production investments can be enhanced by strengthening the roles of financial institutions and technical assistance providers in, respectively, financing cleaner production investments and developing creditworthy cleaner production investment proposals.

China may use similar approaches to develop its own strategies and mechanisms, which may go beyond the environmental policy statements issued respectively by the People's Bank of China in February 1995 and the Ministry of Finance in July 1995 for financing cleaner production investments. In doing so, SEPA should work closely with Chinese financial and banking authorities (People's Bank of China, Ministry of Finance).

Recommendation 9: *Incorporate cleaner production into education and training programmes and curricula at all levels.*

• Inclusion of cleaner production in the regular environmental training programmes for various target groups (decision-makers for economic, regional and sectoral policies at all levels, environmental regulators/government environmental officials, senior company managers, etc.).

• Incorporation of environmental protection and cleaner production into curricula for university students majoring in engineering and business management.

Recommendation 10: *Introduce newer practical environmental management tools step by step. Ecodesign, corporate environmental reporting and environmental technology assessment should be in the first group of such tools to be considered. Efforts to establish sustainable consumption programmes and to use voluntary agreements should be initiated in the future.*

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Notes

1. "The guiding principles" are called *Fang Zhen* or *Zhan Lue Fang Zhen* in Chinese. The "Three Same Steps" (*San Tong Bu*) means that economic construction, urban and rural construction, and environmental construction should be planned, implemented and developed simultaneously. The "Three Unifications" (*San Tong Yi*) means that social and environmental benefits should be combined with economic benefits.

2. China's National Environmental Protection Agency (NEPA) was upgraded to the State Environmental Protection Administration (SEPA) in March 1998.

3. China State Economic and Trade Commission.

4. China Council for International Cooperation on Environment and Development.

5. China's National People's Congress.

6. Swedish International Development Agency.

7. Norwegian Agency for Development Cooperation.

8. Norwegian Society of Chartered Engineers.

9. Ministry of Science and Technology.

10. Australian Centre for Cleaner Production.

11. British Overseas Development Agency.

12. Canadian International Development Agency.

13. Ministry of Foreign Trade and Economic Cooperation.

14. China International Centre for Economic and Technical Exchanges.

15. According to the 1982 State Council Regulations on the Pollution Levy, part of the revenue from the pollution levy should be collected by local environmental authorities to create a pollution control fund for the purpose of pollution control. Enterprises can apply for funding from the fund (before 1988) and low-interest loans out of the fund (after 1988).

16. See *China Environmental Protection Industry*, N° 1-98, p. 7.

17. See the *Cleaner Production* newsletter N° 15 (1998), which was included in *Industry and Environment*, Vol. 21 N° 3, July-September 1998.

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Proactive partnerships between the oil industry and government to establish environmental guidelines: a New Zealand case study

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Abstract
In New Zealand, regulatory agencies and the country's four major oil marketing companies have been working together to ensure that discharges and emissions from petrol and diesel storage and handling facilities meet legal requirements. A process has been developed to identify issues, share knowledge, and develop appropriate standards and operating guidelines. This case study is presented as a model of proactive government-industry cooperation which others might be able to adapt to their particular circumstances.

Résumé
En Nouvelle Zélande, les agences de réglementation et les quatre principales compagnies pétrolières du pays se sont associées pour ramener aux normes légales les déversements accidentels et les émissions des installations de stockage et de manutention de l'essence et du gazole. Un processus permettant d'identifier les problèmes, de partager les connaissances et de définir des normes adéquates et des principes d'exploitation a été élaboré. Cette étude de cas est présentée comme un modèle de coopération dynamique entre le gouvernement et l'industrie, modèle que d'autres pays peuvent adapter à leur contexte spécifique.

Resumen
Las agencias neozelandesas de regulación y las cuatro principales compañías de comercialización del petróleo están colaborando para garantizar que las emisiones y el vertido de petróleo y diesel derivados de su manipulación y almacenamiento se desarrollan de acuerdo con la normativa legal estipuladas. Se han establecido dispositivos de búsqueda de soluciones, intercambio de conocimientos y elaboración de pautas normalizadas y líneas directrices de actuación. Este caso constituye un modelo de cooperación entre el gobierno y la industria, que podría aplicarse en otros contextos, una vez adaptado a sus circunstancias concretas.

Introduction and background

When bodies that are sometimes perceived as opposing forces decide to work together in the interests of improving environmental performance, a considerable degree of success can be achieved. This is what happened in New Zealand when four competitor oil companies and the regulatory community decided to take a proactive approach and work together. The project agreed upon was the joint development of a Code of Practice (CoP) covering the design, installation and operation of underground storage tanks (USTs), with the partners working to clear and agreed desired outcomes.

The four major oil marketing companies in New Zealand – BP, Caltex, Mobil and Shell ("the oil industry") – became aware that the Canterbury Regional Council (CRC) was proposing to draft regulations governing underground storage tanks. The members of the oil industry undertook discussions with the Regional Council and with the Explosive and Dangerous Goods Division of the Occupational Safety and Health (OSH) section of the Department of Labour. They reached agreement to jointly develop the Code of Practice covering the design, installation and operation of USTs. This Code of Practice would cover not only new installations, but also any modifications to existing installations, so that all new or altered systems would be engineered and managed in such a way as to ensure sound environmental performance. In addition, the parties would work together to develop a supplement to the existing Code of Practice covering the many existing installations.

The initial Code of Practice for the design, installation and operation of the systems for new or modified facilities was published in 1992, with Supplement N° 1, covering all existing facilities, being published in 1995.

Prior to and during the developmental phase, the oil industry members were receiving communications from their parent organizations and associates offshore which conveyed the ever increasing stringency of environmental legislation in other countries, how this was being implemented, and how the expectations of environmental activists and the general community were changing. In New Zealand, the Resource Management Act introduced in 1991 had strengthened the role of local government in terms of resource management consents, with strong implications for the role of industry. It made sense for the oil industry to work closely with central and local government to develop the appropriate "rules" for its operations, ensuring consistency and a common understanding of issues, while allowing scarce resources to be shared for the benefit of all.

Forging the partnership

The Ministry for the Environment (MfE) was very receptive to the proactive approach suggested by the oil industry, and became involved in discussions on how best to develop the concept and move it forward from an idea to constructive activity – a project. The Ministry suggested that the environmental manager of the Wellington Regional Council should become involved, which resulted in the support and interest of other Regional Councils being established. At a meeting of representatives from the oil industry and from central and local government in July 1993, the concept of a proactive partnership to establish environmental performance standards appropriate to the industry was explored and agreed to.

Focal issues

After much debate, the parties agreed that the partnership would focus on five issues:

- above ground storage tank farm containment systems;
- analytical methods;
- water quality guidelines;
- existing underground tanks at service stations and other locations;
- contaminated site management guidelines.

Later, air quality was added to the list.

Process, funding, participants and roles

Of the 15 Regional Councils and Unitary Authorities in New Zealand, five considered that they had the expertise and resources available to make a valuable contribution. The remaining councils/authorities agreed to delegate development of any documents – and hence the environmental standards/guidelines – to these five, as long as they were kept fully apprised of developments. The five Regional Councils selected were: Auckland, Waikato, Taranaki, Wellington and Canterbury. The Ministry for the Environment would be a lead participant in examining all of the focal issues, and would also recommend when other government agencies and NGOs needed to be involved.

The oil industry agreed to fund the development costs of the project, since the industry stood to be the major beneficiary from the environmental performance guidelines. However, this funding was not to extend to any major research projects, which all of the partners agreed should be treated as external to the central project.

A process was developed which drew up formal terms of reference between the Ministry for the Environment, the Regional Councils and the industry. For each of the selected issues, a formalized scope of work was developed. All parties recognized that it would be impossible to draft guidelines that would apply to all environmental settings in New Zealand. Using the 80/20 rule,[1] typical environmental settings were defined for use within each set of guidelines. For example, for contaminated sites this involved categories of soil types, groundwater depth and use, distance to surface water bodies and their sensitivity, and land use.

While the process would vary slightly for each category, it was adopted as a basic principle that the industry would develop initial draft guidelines which the other partners would then consider and comment on. The guidelines would go through several iterations until the partners felt that they had a draft that could go on to wider consultation with, for example, the Retail Motor Trade Association, the Manufacturers' Federation, Territorial Local Authorities, the Employers' Federation and the Ministry of Health.

After that, comments and submissions would be amalgamated from across the nation and considered by the lead group: the five Regional Councils, the Ministry for the Environment and the industry partners. Decisions were then to be made, drafts amended, and advice given back to those having made submissions on how their contribution had been used. Copies of this information would also be retained for future reference, and to demonstrate the extent of the consultation process undertaken.

Following this process, the final document would be published as guidelines or Code of Practice, depending upon which Central Government Agency had prime responsibility.

Resource identification

All the lead partners had expertise in this area which was, or will be, utilized. For example, the Regional Councils have planning and monitoring expertise, as well as an understanding of the state of their local resources. Central and local governments have offshore networks and access to technical literature, as well as employing some internal experts. They have also undertaken consultation with the community to gain feedback on what are seen as its environmental concerns.

The industry knows its own business – what management programmes and controls it has in place, and where these are deficient. It has an understanding of the impacts of its activities on people and the environment. Effects on human health are particularly well understood, even though some international debate continues to rage – for example, as to whether there is an acceptable tolerance of carcinogenic substances. Environmental effects are also well understood, and New Zealand's Resource Management Act requires that assessments of effects (impacts) upon specific environments be known and then avoided, mitigated or remedied.

Communication

A key to the success of the partnership has been the initial development of the groups' terms of reference, with topic discussion papers produced and agreed scopes of work prepared for each issue. The project is now in its sixth year. Given the time and the changes to personnel that have taken place, it would have been very easy to lose track of the original goals if the formal terms of reference had not been developed.

The use of tools such as E-mail has allowed parties to access each other's resources and to share communication jointly and simultaneously. Processes have been agreed for communication between the many local authorities and the project group. The Ministry for the Environment's newsletter, *Environment Update*, has been useful for communicating the group's goals and the status of the project to a very wide audience. This has helped identify interested parties for consultation on the various issues. Technical papers have been prepared and published in technical publications such as *Water and Wastes* and *IPENZ* magazines. Communication with external groups has presented a challenge: the whole process has had to be very open. The independent role the Ministry for the Environment has played with regard to developing communication bulletins, facilitating meetings and generally working to keep the parties focused on the greater goals, as stated in the work scopes, has positively aided communication.

Conflict resolution

The potential for conflict is always real when parties with such diverse interests and backgrounds come to work together. There is also the potential for rivalry when very vigorous competitors decide to try and work together. Conflict has arisen during the course of the project, but to the credit of all parties this has been minimal and has not had an adverse impact on the project to date. This demonstrates the value and the vital role of having predetermined processes for resolution of disagreement between:

- competitors;
- regulatory authorities;
- industry and regulators;
- emotion versus science;
- time and resource conflicts.

What has been achieved to date?

The working group has achieved or is well on the way to achieving a considerable number of the goals set out in the original programme. These include:

- Codes of Practice for the design, construction and operation of underground petroleum storage systems;
- publication of a Code of Practice for the disposal of used USTs and their related wastes;
- publication of a guideline for containment systems for above-ground storage tank farms;
- a guideline for analytical methods which is 98% completed;
- a best practice document for surface water discharges from service stations and other petroleum storage and handling facilities;
- a draft guideline for the management of oil industry contaminated sites (this has been produced).

(It is expected that the last three documents will be completed and published within the next twelve months.)

Moreover,

- an agreement has been drawn up to work together on air discharges associated with the oil industry;
- there is a proven process in place through which industry and "regulators" can work in partnership for the environmental benefit and sustainable management of New Zealand's natural and built resources;
- a knowledge of the industry has been gained by regulators, and vice versa. A strong rapport has developed between the parties;
- this initiative is held up to other industries as a possible path they could and should take.

Lessons learned

The project has provided a valuable and unique learning experience which has been beneficial to all concerned, whether centrally or peripherally. The lessons learned have been many and varied, and are worth listing for the benefit of others. They include:

- the wisdom and value of agreeing the issues and their priority at the outset of the project, which also assisted with planning resourcing;
- the value of preparing an issues paper for each topic and agreeing scopes of work for each;
- the importance of identifying opinion leaders from within the various parties, and then ensuring their commitment and maintaining effective communication between them;
- having the documents published by the Ministry for the Environment and the OSH Department, which has given them credibility;
- the lesson learned from major underestimation of resourcing requirements, both internal and external, and of the time and cost that would be involved in developing the guidelines. Once a scope of work is agreed, a project plan is required

and project management disciplines are to be applied and used effectively.

In addition,

- once a document is drafted, a regulatory authority with national responsibility and a proven network is required to coordinate and facilitate the consultation process;
- there is a need to have a programme for comprehensive coverage of environmental issues. This is what allows progress to be made without additional issues and problems distracting from the focus of the issues;
- there is a need for all organizational representatives to take their respective organization colleagues along with them. This allows decisions within the organization to be consistent with the direction of the guidelines under development, and ensures management commitment to provide resources;
- there is a need for the chairpersons of the partnership to be senior members of their organizations and respected members of the total team;
- it is important to establish criteria which allow external service providers to be fully evaluated;
- the effort required for consultation consumes much time, but its importance cannot be underestimated. A record of the consultation that takes place should be maintained to ensure that the due diligence process can be demonstrated to all at a later date;
- the need for conflict resolution procedures and sound chairmanship skills is paramount;
- there is a need to clearly establish boundaries within the scopes of work; for example, not trying to develop the guidelines to cover every circumstance; development of generic receptors; specifying the products the guidelines will cover; using the 80/20 rule;
- there are difficulties in restricting the issues to be covered;
- it is essential to ensure that new team members understand how current positions have been arrived at;
- the group must be prepared for the fact that, during long-term projects in areas such as the environment, learning and knowledge changes and the "goal posts" are apt to change. Flexibility needs to be built into the project to allow for this;
- all parties involved have time pressures of their own, and these need to be appreciated by others;
- a sound communication strategy is vital if communication difficulties between partner members and within organizations are to be avoided;
- budgets need to be flexible over time;
- a proactive approach by industry raises its profile with authorities much earlier than might have been the case. Industry needs to be prepared for the fact that this will happen and manage it;
- there are inherent difficulties in such a diverse group working together, requiring compromise by all parties;
- there is a need to ensure that there is a common understanding of language. Industry has to be prepared to be open and to help others understand how it operates and what its standards are, warts and all;
- there is a need to ensure that industry colleagues do not look for commercial advantage and exploit each other's weaknesses; there must be an ethical understanding between partners, and mutual trust;
- it is important to ensure that offshore professional rivalries are not imported into New Zealand. This means that impartiality in the goals and objectives set is essential;
- above all, participants need a sense of humour and the ability to see the brighter side of situations when the going gets tough.

Conclusion

Since the inception of this project in mid 1993, much has been achieved. Four Codes of Practice/guidelines have been published, resulting in improvement of industry environmental performance. The oil industry has developed a proven partnership and processes with regulators and other community members.

New Zealand has contributed to the international community's understanding of hydrocarbon contaminated sites and formed valuable networks with overseas parties. Regulatory agencies have enhanced their understanding of how the oil industry works. This partnership has proved successful, and has provided an example for others interested in improving environmental management. Finally, it supports the goals of the New Zealand Resource Management Act.

Note

[1] The "80/20" rule refers to the Pareto Principle, according to which a company will not look for 100% solutions to problems but will concentrate on the top 20 issues and obtain an 80% benefit from working on these rather than trying to work on all issues. The partners were not looking for solutions to all the problems they could find. Instead, they focused on those that were most important relative to their facilities' discharges/emissions and worked to find appropriate standards for discharges/emissions in these identified areas. In this way, the companies might achieve an 80% improvement in environmental performance, and an improvement in 80% of the environmental settings. ◆

Recycling of plastics in Japan

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Abstract
The Clean Japan Center is an NGO concerned with recycling. This article presents an overview of methods for recycling products made of various types of plastic. A number of such methods are in use or being studied. Emphasis is given to the state of plastics recycling in Japan.

Résumé
Le Clean Japan Center est une ONG spécialisée dans le recyclage. Le présent article dresse un panorama des méthodes de recyclage des produits en divers types de matière plastique. Plusieurs d'entre elles sont déjà en usage ou à l'étude. L'article met l'accent sur la situation au Japon en matière de recyclage des matières plastiques.

Resumen
El Clean Japan Centre (Centro Limpio de Japón) es una ONG consagrada al reciclado. El presente artículo expone a grandes rasgos los métodos de reciclado de productos derivados de diversos tipos de plástico. Algunos de esos métodos se están utilizando ya o están siendo estudiados. Se hace hincapié en el grado de desarrollo del reciclado de plásticos en Japón.

Introduction

Plastic products were introduced in the latter half of the 1950s, replacing conventional materials in various fields. Plastics were lighter in weight, superior in durability and (when used as packaging material) better for preserving products.

Partly due to the wide use of plastics, foods, including perishable ones, can withstand long-distance transport and long-term storage. Perishable foods are now imported from all over the world, whether they are in season or not.

Food is not the only type of product that has undergone a drastic change as the Japanese economy has rapidly expanded. Clothing and housing have also become more diverse and of better quality. As daily necessities are provided in abundance and at low prices, and consumed in increasing quantities, a major problem has arisen: how to dispose of such goods after using them.

Disposing of waste, whether it is industrial or general waste, presents two main difficulties: increasing costs and a decreasing amount of space for final disposal sites. The existing final disposal sites are nearing the limit of their capacity, and land for new disposal sites is increasingly difficult to find. It is feared that these problems, if left as they are, will be a major hindrance to industrial activities and the maintenance of people's living standards.

From this viewpoint, as well as in order to maintain present living standards by preserving non-renewable resources, it is important to obtain resources from waste and use such resources as commodities.

Waste problems in Japan

Responsibility for disposing of waste and quantities of waste discarded

In Japan, waste is classified as either industrial or general. Industrial waste, which is generated by industrial activities, is supposed to be handled by businesses. Industrial waste consists of by-products generated during the production processes of each industry, plus 18 types of waste generated in the course of distribution or sales (some types are limited to certain industries). The total amount of industrial waste, including sludge and construction waste, generated in Japan is estimated at about 400 million tonnes a year. This amount, after undergoing intermediate processing such as incineration, condensation and recycling, is reduced to 80 million tonnes (as of 1996) for final disposal.

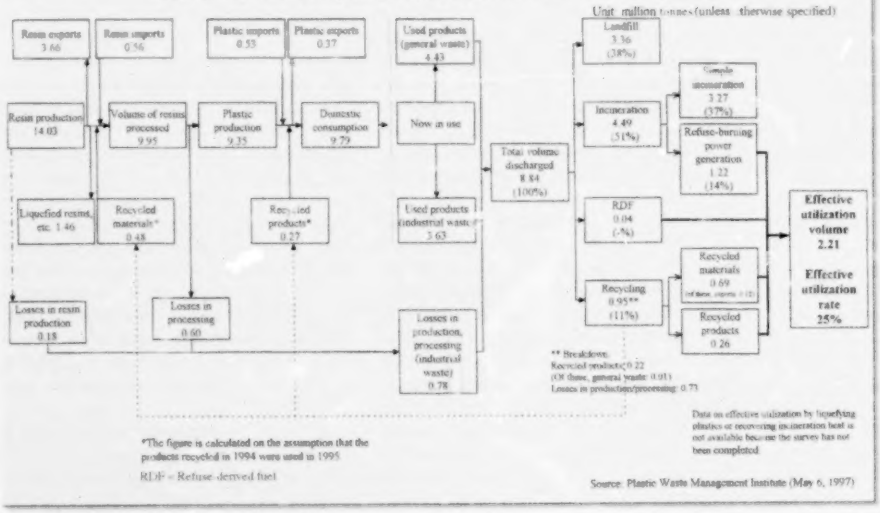
General waste, which is generated by households, is supposed to be dealt with by municipalities. The treatment of general waste is one of the important responsibilities of municipalities; it prevents this waste being a source of infectious disease or other health problems.

The total amount of general waste generated in Japan is estimated at 50 million tonnes a year (about one kilogram per person per day). Of the total, some 75% is incinerated, 12% is recycled or treated using other types of intermediate processing without incineration, and the remaining 13% is sent to be dumped at landfill sites. The total amount of waste buried in final disposal sites per year is 14 million tonnes (as of 1996).

General waste discharged from households is diverse in type. It includes kitchen refuse, waste plastics, bottles, cans, clothes, furniture and home electric appliances. In each municipality, such general waste is separated into specified groups according to type, capacity or other factors related to the waste disposal facilities and then collected for disposal.

General waste is basically classified into flammable garbage (kitchen refuse, waste paper, waste wood, waste plastics, etc.), which is incinerated, and

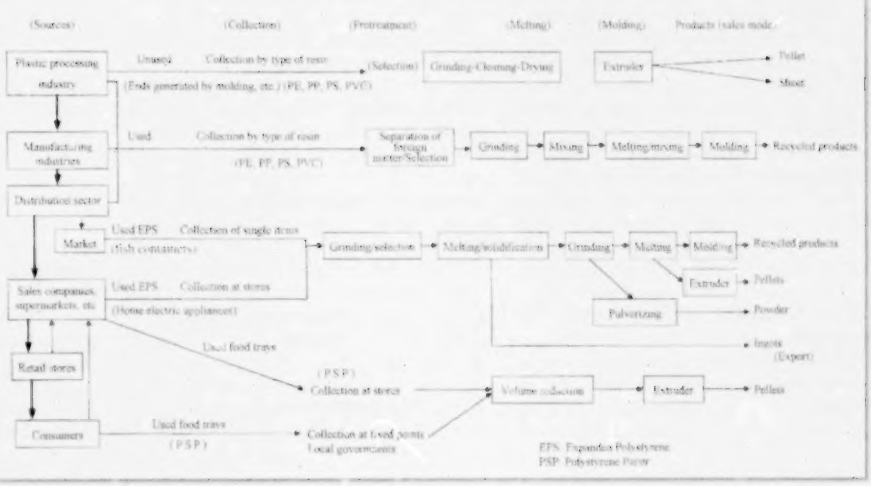
Figure 1
Flow chart of the recycling of plastic products and waste (1995)


Unit: million tonnes (unless otherwise specified)
Resin exports 3.66
Resin imports 0.56
Plastic imports 0.55
Plastic exports 0.37
Used products (general waste) 4.43
Resin production 14.03
Volume of resins processed 9.95
Plastic production 9.35
Domestic consumption 9.72
Now in use
Liquefied resins, etc. 1.46
Recycled materials* 0.48
Recycled products* 0.27
Used products (industrial waste) 3.63
Losses in resin production 0.18
Losses in processing 0.60
Losses in production, processing (industrial waste) 0.78
Total volume discharged 8.84 (100%)
Landfill 3.36 (38%)
Incineration 4.49 (51%)
Simple incineration 3.27 (37%)
Refuse-burning power generation 1.22 (14%)
RDF 0.04 (~%)
Recycling 0.95** (11%)
Recycled materials 0.69
Recycled products 0.26
Effective utilization volume 2.21
Effective utilization rate 25%
** Breakdown:
Recycled products 0.22
(Of these, general waste: 0.01)
Losses in production/processing: 0.73
Data on effective utilization by liquefying plastics or recovering incineration heat is not available because the survey has not been completed.
*The figure is calculated on the assumption that the products recycled in 1994 were used in 1995.
RDF = Refuse-derived fuel
Source: Plastic Waste Management Institute (May 6, 1997)

non-flammable garbage (glass, broken ceramics, waste plastics, small electric appliances, etc.), which is disposed of at landfill sites. Among other types of waste are bulk domestic waste items such as furniture and large home electrical appliances, as well as readily recyclable waste such as glass bottles, steel cans, aluminium cans, newspapers and PET (polyethylene terephthalate) bottles. Recyclable waste is sorted according to these types of waste for actual recycling.

It is important to note that in Japan waste plastics are classified into broad categories as either flammable or non-flammable, depending on the municipalities, whose waste disposal facilities vary in type, capacity, etc. An increasing number of municipalities are recycling waste plastics through separate collection according to the Packaging Recycling Law. This law, officially referred to as the Law for Promotion of Sorted Collection and Recycling of Containers and Packages, is discussed below.

Figure 2
Recycling flow of plastics in industrial waste



Guidelines of the Industrial Structure Council

To address the problems of increasing waste, the Industrial Structure Council, an advisory body to the Ministry of International Trade and Industry (MITI), drew up guidelines in 1990. The Council established a waste disposal and recycling section, studied waste categories and problems in each industry, and came up with specific measures and numerical targets designed to reduce waste generation and promote recycling. Since then, the Council has been monitoring and reviewing the numerical targets. In the latest guidelines released in April 1997, the Council designated 21 categories and eleven industries, and strengthened or re-established existing measures to meet the needs of the times. Among such measures are reduction of waste generation, development of recycling technologies, and the creation of social arrangements to promote recycling.

The guidelines indicate not only what industry should do for the reduction or effective use of industrial waste in production and distribution processes, but also what it should do in regard to collection and recycling of containers and packaging discarded by households.

The Packaging Recycling Law

The Packaging Recycling Law was enacted in 1996. This law is designed both to reduce the amount of general waste buried at final disposal sites, since landfill space is decreasing, and to recycle waste with a view to creating a social system that can cope with resource depletion in the future.

The law focuses on containers and packaging. Of all kinds of general waste, containers and packaging, including bags and wrapping paper for foods, drinks and other daily necessities, account for 25% by weight and about 60% by volume.

The law says that the manufacturers of containers, or businesses that sell products in containers and packages, should be responsible for recycling a certain amount of the material used in containers and packaging according to the volume they make or use. If they cannot comply, they are responsible for paying for it to be done. The cost is passed on to consumers in the form of higher retail prices.

Here is the background of this idea. The biggest obstacle to recycling containers and packaging is that, in many cases, it does not pay. The cost of recycling a particular item is usually higher than the sales price of the recycled item. No business dares to engage in such unprofitable recycling. This is why a system in which each sector takes over the burden of part of the recycling costs is essential. It seems that things are going in that direction. In recent years, a growing number of municipalities charge residents part of the costs based on the amount of waste they discard. In the past, municipalities covered the cost of disposal of general waste using taxpayers' money.

It is difficult, however, for businesses to take over the responsibility of recycling themselves. Such businesses pay commission fees to the Japan Container and Packaging Recycling Association, which is similar to Dual Systems Deutschland (DSD) in Germany and Eco-Emballages in France. This association takes charge of recycling on behalf of the businesses. It is different from DSD in that municipalities in Japan are responsible by law for collecting waste using their own budget.

In April 1997, separate collection and recycling of glass bottles and PET bottles was launched. Preparations are now being made for the recycling of waste plastics other than PET bottles; this recycling will start in April 2000, with businesses bear-

The Packaging Recycling Law does not stipulate responsibility for recycling aluminium cans, steel cans and paper cartons. These items, once collected, can be recycled without additional financial contributions from businesses even under the existing system.

Recycling of plastics in Japan

Use of plastics in Japan

Although various types of plastics are used in Japan, polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC) and polystyrene (PS) account for 67% of the total consumption. Thermoplastic resins, including these four major resins, account for 85.7% (as of 1994).

As for the breakdown of plastic consumption by type of use, films or sheets account for 37.1%, machines and instrument parts 12.7%, pipes or joints 11.9%, foam products 7.8%, miscellaneous goods for daily use 5.4%, building materials 5.2%, and containers 4.9% (as of 1994). Machine and instrument parts, building materials, fibre-reinforced plastic (FRP) bathtubs, and ships are in use for a long time, from several years up to ten plus years as durable goods. On the other hand, plastics used as packaging material for foods or drinks stay in households for several days or even weeks before being discarded as waste.

Material flow of plastics

The Plastic Waste Management Institute collects annual data on the production of plastic resins and moulded plastic products, the volume of plastics in general waste from households and in industrial waste from businesses, and the volume of such plastics that are recycled (**Figure 1**).

According to 1996 data, domestic production of plastic products in Japan totaled 9.39 million tonnes and the volume of materials recycled was 0.95 million tonnes (accounting for 11% of the total amount of polymers discarded). Unused

plastic waste generated in the process of resin production or moulding was mainly used as recycled material or in recycled products. About 0.78 million tonnes of unused plastic waste was generated and, of this, 0.73 million tonnes or about 94% was recycled as materials. On the other hand, 8.06 million tonnes of used plastic waste was generated as either general or industrial waste and, of this, 0.23 million tonnes or about 2.9% was recycled as materials. These figures show that recycling used plastic waste at the material level is difficult.

As for the breakdown by type of use, vinyl sheeting for farming (as soil covering, etc.) accounted for about 45%, expanded polystyrene paper (PSP) for 28% and PET bottles for about 3%.

Cases of recycling of plastics as materials

General purpose thermoplastic resins

Thermoplastic waste plastics such as PE, PP and PS are used for a) civil engineering/building materials, e.g. for synthetic wood, manhole covers, imitation wood and plant stakes; b) materials used in agriculture and fisheries; c) materials in various products such as containers, cassette tape cases and toys. Even mixed thermoplastic resins, if their component ratios are stable, are used in products according to their properties.

If waste plastics are properly sorted according to colour and type of resin, they can be processed to make pellets, flows and granules to be used as ordinary materials for moulding resins. In this case, such resins are mixed with virgin resins for use in products that are similar in function to the original products from which the waste plastics were extracted.

In many cases, this kind of recycling can apply to unused industrial wastes generated in the process of resin production as irregulars, or those generated in the process of resin moulding processing as ends.

Expanded polystyrene

The production of polystyrene stood at 225,000 tonnes in 1996. Of this, 180,000 tonnes which could theoretically be recycled (the remaining 45,000 tonnes was exported or used in durable goods) was used for fish containers, packaging of home electrical appliances, etc. Of the 180,000 tonnes, 28.7% or 52,000 tonnes were recycled. Of this recycled amount, 53.3% was exported as ingots to be used to make recycled products abroad; 20.7% was processed into pellets and recycled; 21.5% was pulverized and recycled; 4.5% was used as a source of energy. Recycled expanded polystyrene is used to make miscellaneous goods for daily use, such as stationery goods and cassette tape cases.

Polyvinyl chloride used in farming

About 100,000 tonnes of polyvinyl chloride is used as sheeting in farming annually. Of this amount, about 45% is recycled, most is used to make materials for civil engineering works (as of 1993).

Recycling of PET bottles

The production of PET bottles was about 200,000

US EPA proposes collaboration with business on clean technologies

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The US Environmental Protection Agency is proposing to launch a strategy to cooperate with American business in fostering US technology exports. The initiative is designed to address mounting concerns about the need to promote new, more efficient and environmentally safe technologies for sustainable development. In a report to Congress, *EPA Strategy for Promoting US Environmental Exports*, the Agency has laid out a plan for disseminating environmentally sound environmental protection technologies. An added benefit of this strategy would be to increase commercial opportunities for US businesses.

The Agency's initiative responds to US congressional committee urgings that EPA should "play a stronger role in enhancing opportunities for industry to export environmental technologies to other countries." It also responds to the US Administration's 1995 national strategy to promote environmental technology, "Bridge to a Sustainable Future", and to US business executives' calls for greater governmental efforts to support environmental technology exports.

Helping US business promote exports

EPA's proposed initiative emphasizes the importance of US private sector participation in distributing proven and cost-effective environmental technologies and services world-wide. According to Environmental Services International Inc., that market is estimated at US$ 410 billion annually, with growth rates ranging from 3-4% in most industrialized countries to 16% in parts of Asia. It is expected to exceed $540 billion next year.

The UNEP report *Sustainable Business – Economic Development and Environmentally Sound Technologies* projects a slightly smaller near-term market, amounting to US$ 300-600 billion annually for pollution control and $250 billion for energy conservation over the next 20 years.

The United States accounts for over $180 billion, or 44%, of this total. Yet its export lead in regard to environmental technologies has been declining in many areas, for example water and wastewater treatment systems, and the percentage of its revenues derived from environmental exports falls well behind those of some other countries such as Germany and Japan.

Fulfilling EPA's basic mission

Commenting on the new strategy, Carol Browner, EPA's Administrator, has pointed out that "Technical cooperation has played an important role in foreign policy initiatives in Latin America and with Mexico, China, India, Russia and South Africa. EPA's technical assistance and training programmes create demand – and markets – for environmental technologies and expertise." The new strategy would build on EPA's current international efforts to promote international cooperation. These include providing technology collaboration, technical assistance and training, information exchange, technology demonstrations, financial assistance leveraging, and cooperative research and development.

According to Alan Hecht, EPA's Deputy Assistant Administrator for International Activities and chair of the agency task force that developed it, "The proposed initiative would demonstrate the effectiveness and capabilities of available and emerging US environmental technologies and show how they can help solve local, national and international environmental problems."

EPA hopes to achieve this by bringing the Agency's unique technical expertise and foreign contacts together, and by coupling pressing environmental problems abroad with the supplies of proven and cost-effective technologies and services in the United States.

The programme would concentrate on two major components – project-specific technical assistance, training and information, and in-country technology demonstrations. It would strive for concrete and measurable environmental and economic results, while avoiding process activities such as meetings, conferences and workshops.

Building on existing relationships and activities

Jamison Koehler, Director of EPA's international technology office, has also pointed out that the technical assistance "would build on EPA's long-term relationships with partner countries and focus on activities in which EPA can make a difference." EPA experts would provide short-term assistance, or arrange for cooperating country decision-makers and technical staff to visit the United States for brief, project-related training and site visits.

Under the proposed programme, EPA would work with US industry trade associations, state government environmental business groups, and professional societies to identify overseas opportunities. EPA experts may be able to work with World Bank and multilateral development bank officials in some of their environmental activities.

On the information front, the initiative would dedicate funds to dissemination of information packages on generic technical assistance, sector-based

tonnes in 1996. Some 5000 tonnes was recovered. As the Packaging Recycling Law requires recycling of PET bottles, efforts are being made to increase the amount recycled to 21,000 tonnes with the development of recycling facilities.

Of the recycled PET bottles in 1996, 43.5% was used for textile products such as shirts and carpets, 30.9% for dividers and stationery goods, 21.4% for containers for shampoo and other products.

Chemical recycling

Chemical recycling refers to the use of waste plastics as petrochemical raw materials after reducing them to their monomers or liquefying/gasifying them.

Regarding polystyrene (PS) and polymethyl methacrylate (PMMA), the process of recycling monomers of by-products generated in the production process has been established. Studies are being conducted on the recycling of monomers from textile products such as polyester and nylon.

Studies are also under way to recycle polyolefin plastics. The short-term objective is to liquefy the polyolefin plastics by thermal decomposition and recover them as a fuel oil.

The use of used plastics as raw materials is still at an experimental stage. Its success depends on stable supplies of carefully-sorted waste plastics in large quantities and the development of technology that makes recycled materials competitive with virgin materials.

Use of recycled plastics as materials in other industries

Use of waste plastics as a reducer in blast furnaces

Attention is being paid to a method in which ground waste plastics are fed from the bottom into a blast furnace producing iron ore, in place of coke and pulverized coal. This method has already produced results in Germany. In Japan, a steel manufacturer has started experimenting with this method. A major advantage of the method is that waste plastics can be used in existing steel manufacturing facilities based on blast furnaces. As pretreatment, waste plastics only need to be processed so that they can be fed into the blast furnaces.

At present, this method seems to be based on mixed plastics excluding polyvinyl chloride. It is hoped that the method can be applied not only to plastics in industrial waste but also to those in general waste. Research and development is being conducted to reduce the vinyl chloride component of the waste, or the chlorine produced in recycling it.

Use of waste plastics in cement kilns

Waste plastics and discarded tyres are used as a source of heat in cement kilns as an alternative to pulverized coal, reducing the use of secondary materials. This technology can be applied to mixed plastics.

This is one of the effective methods of recycling, in that it does not require modification of the existing industrial facilities.

training and information tools, and new forms of environmental protection. It would continue small-scale development of technical pollution prevention materials, along with information on US technology manufacturers.

Demonstrating technologies

"The centerpiece of the Agency programme," according to Mr Hecht, "would be in-country demonstrations of environmental technologies. These are among the most effective ways to promote technologies and services. They prove to potential customers overseas that the technology in question works. They also often lead to follow-on business for US firms." EPA officials are well qualified to work with foreign governments and vendors to demonstrate low-cost, conventional technologies as well as more innovative techniques and approaches to pollution control. "American companies are in the forefront of developing many of the technologies to deal with these problems."

US firms have been prominent in efforts to capture and use methane from landfills, coal mines, livestock ponds and coal-bed methane recovery. They have experience in Mexico, Ecuador and China developing and marketing low-cost and easy-to-maintain safe drinking water sources. US vendors are competitive in dealing with abandoned hazardous waste sites and using sewage sludge to revegetate land contaminated by mining and smelting operations. EPA has worked with US firms on emission controls for an electric arc furnace in Russia, and the Russians are now evaluating other related projects there.

The technology programme would require EPA to work even more closely with other US federal agencies (the Departments of Commerce and Energy, the Agency for International Development, the Export-Import Bank and the Overseas Private Investment Corporation) and with the country's private sector.

Technology verification

Although technology verification is not explicitly included in the strategy, EPA is also looking into potential international applications of its Environmental Technology Verification (ETV) programme. EPA launched ETV in 1995 to address the need to obtain independent, credible performance data on environmental technology from technology buyers and permitters in the US and abroad.

Over the last few years, EPA has formed public and private partnerships for twelve ETV pilot projects to verify the environmental performance of commercially-ready technologies in all media. These include industrial pollution prevention; recycling and waste treatment; advanced air, water and field monitoring technologies; and air pollution control and greenhouse gas reduction technologies. EPA is now working through the Asia-Pacific Economic Cooperation (APEC) forum to share verification testing protocols, and with UNEP to coordinate different verification systems now under development in various parts of the world.

Proceeding judiciously

While there is excitement and enthusiasm at EPA about the projected new venture, which would link its environmental goals to broader commercial opportunities, Agency officials are proceeding with caution. Some members of the US Congress are sceptical about the Agency involving itself directly in promoting exports of technology and services. Several years ago Congress eliminated EPA's earlier US Technology for International Environmental Solutions (TIES) programme, which involved environmental exports. They also cut most of the funding for EPA's earlier Environmental Technology Initiative Programme.

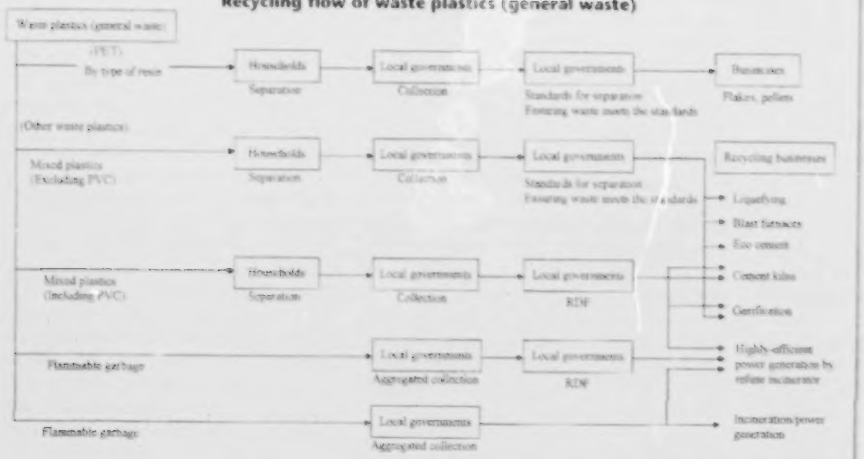
EPA's mandate to protect and improve human health and the environment is not without some legal, ethical, policy and funding constraints. Administrator Browner has emphasized that "EPA is known for its honesty and objectivity. Agency spokespersons are always careful to stress that we do not endorse particular private sector firms or seek to promote certain goods and services." Additionally, the Agency does not have a clear mandate for export assistance to US suppliers, or for funding transfers for export promotion.

However, EPA officials are convinced that the Agency, like environmental ministries in other countries, must take a lead in helping develop and promote the use of clean technologies to minimize harmful effluents, emissions and wastes from all sources. And they know the only way these technologies and services can be fashioned and distributed world-wide is through active cooperation with the business community that develops and provides most of them.

They are hopeful that, by fostering a business climate that helps US companies compete in the growing world market for sustainable technologies, their new export promotion initiative will obtain broad support in the United States. At the same time, it would stimulate the global market for these valuable technologies and, above all, contribute to sustainable development throughout the world.

**Former Deputy Executive Director of UNEP and Vice President for Operations at the Worldwatch Institute in Washington, D.C. Mr Mansfield is an international environmental consultant based in Bethesda, Maryland.*

Figure 3
Recycling flow of waste plastics (general waste)



(Source: Plastic Waste Management Institute)

Thermal recycling of plastics

Thermal recycling means the use of heat generated when flammable wastes such as waste plastics are burned in incinerators for the purpose of heating or power generation. This is effective in conserving resources when sorted collection by type of plastics is difficult.

Large cities have the capacity to generate power by incinerating plastics combined with other flammable wastes. (Heat generated in this way produces high-pressure steam to drive the turbine.) Medium and small cities cannot build incineration plants, due to the small amount of waste collected within their collection areas. One solution to this problem being studied is to establish suitable collection areas and then construct intermediate processing facilities covering these areas, so that the waste processed at such facilities will be used as a fuel to generate power.

As intermediate processing, it is possible for waste plastics to be turned into refuse-derived fuel (RDF) or oil to recover energy. RDF is characterized by its wide range of applications. It does not require a complicated separate collection system, as waste paper, kitchen refuse and other non-plastic wastes can be also mixed into the RDF.

Outlook for recycling of waste plastics

Plastics have excellent durability, and it is hoped that the relatively short usable period of containers and packages will be extended in order to promote the conservation of energy and resources. Likewise, it is desirable to recycle plastics in a condition as close as possible to that required in the finished products. This will contribute to energy conservation.

As far as the recycling of used plastic is concerned, the extent of contamination, the composition of different types of materials, the volume, and the stability of supplies have a considerable impact on the costs and the choice of a recycling process. For example, the simplest method is to grind waste plastics and mould them, but the market for products manufactured by this method is limited and, in many cases, the value of such products is low. In order to use a large amount of waste plastics in a wide variety of goods, just as virgin plastics can be used, it is essential to sort waste plastics into a single type of material. When plastics recycled in this way, if mixed with virgin materials to be used in the moulding process of existing products, reduce the cost of goods in manufacturing facilities and also make it easier to develop a wide range of products. On the other hand, the cost of such recycling is high. Therefore, it is necessary to balance these advantages and disadvantages in recommercialization.

Figure 2 shows the recycling flow of waste plastics in industrial waste. One example of the recycling of packaging materials covering the distribution sector, retailers and households is the system of collecting expanded polystyrene (EPS) for fish containers and for packaging of home electrical appliances.

Recycling plastics used in automobiles, home electrical appliances, etc. at the material level is under study. Some bumpers, instrument panels and other plastic parts are now recycled at this level. In many cases, however, only metal parts are recovered and the remaining parts are shredded and disposed of in landfills. In the recycling of such shredded waste, chemical recycling and thermal recycling are expected to play an increasing role.

There are many obstacles to recycling of plastics in general waste at the material level. This is because various types of plastics are used for different purposes (Figure 3). PET bottles and food trays (made of polystyrene paper, PSP) are exceptions. They can be recycled in their present form as plastics.

When it is possible to distinguish many types of plastics as a whole from other wastes (although not separated according to the type of resin), it is effective to use such plastics as a reducer in blast furnaces or as fuel for cement kilns. This is an effective method since it does not require modification of the existing industrial facilities.

Among other methods that deserve attention are power generation by incineration of refuse or highly efficient power generation using RDF made from waste collected over a wide area. These methods do not require separation of plastics from other flammable garbage.

** The Clean Japan Center is an non-profit organization committed to recycling. For more than 20 years since its foundation in 1975, the Center has been working with the central and local governments as well as industry to help create a recycling-oriented society through reducing, processing and recycling waste. Specifically, the Center has been engaged in the following activities: 1) promotion of the development of recycling technology, 2) research and study, and 3) public relations and international exchanges.*

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Tourism Focus

A regular section reporting on developments in the field of sustainable tourism, and on the activities of the UNEP Tourism Programme

N° 11, 1998

Tourism and coral reefs

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Abstract

Sustainable tourism development can allow countries with coral reefs to benefit economically from tourism. However, coral reefs are threatened by natural and human-induced environmental stresses often directly or indirectly related to tourism. Sustainable tourism requires that all activities in those countries be integrated into a comprehensive plan with a long-term approach. It also requires a political will at appropriate government levels, and that all stakeholders be included in decision-making on both current and future tourism projects.

Résumé

Le développement du tourisme durable est l'occasion, pour les pays qui possèdent des récifs coralliens, de bénéficier des avantages économiques du tourisme. Le problème c'est que ces récifs font l'objet de menaces environnementales naturelles et anthropiques, souvent directement ou indirectement liées au tourisme. Le tourisme durable nécessite l'intégration de toutes les activités de ces pays dans un plan global à long terme. Il suppose également une volonté politique à tous les niveaux de gouvernement impliqués et la participation de toutes les parties prenantes aux décisions touchant les projets touristiques actuels et futurs.

Resumen

El desarrollo del turismo sostenible puede aportar grandes beneficios económicos a los países que cuentan con arrecifes de coral. Sin embargo, el coral se ve amenazado por los embates naturales y por la actividad humana, provocados directa o indirectamente por el turismo. El turismo sostenible conlleva la inscripción de todas las actividades turísticas en un plan integral, aplicable a largo plazo. A esto debe unirse el apoyo político de las esferas gubernamentales apropiadas y la inclusión de todos los sectores concernidos en la toma de decisiones relativas a los proyectos turísticos inmediatos y futuros.

Coral reefs have developed all over the world, in the two tropical zones and in the three oceans. They expand near the surface along coasts where the sea water temperature is above 20 °C. Occupying about 1 million square kilometres, they are the world's most important constructions built by living organisms. Corals (about 800 species) are the main builders of these huge masses of calcium carbonate. The living reefs lie atop the skeletons of billions and billions of ancestors. The ability of corals to have such a calcium carbonate skeleton is due to their symbiotic relationship with the algae they breed in their soft tissues. A square metre of a coral community can calcify up to 10 kg of carbonate per year. In the Indo-Pacific, calcareous algae are also important as builders.

In that framework – like buildings in a city – almost every animal phylum on the planet has representatives. There are so many species that the coral reef ecosystem is the most diverse in the sea and as rich as tropical rain forests. Other main inhabitants are echinoderms, molluscs, sponges, crustaceans, worms, and of course fishes. Coral reefs can develop in nutrient-poor waters with a great ability to recycle organic matter and a very high productivity.

Coral reefs and humans

But like every place on earth, coral reefs are of interest to human populations. About 100 countries are bordered by coral reefs, almost all developing countries faced with managing problems including increasing demographic pressures. Half a billion people live within 100 km of a coral reef, and some 100 thousand take all they need for life from coral reef resources. Reefs protect the coastline and communities may develop nearby, often attracted by their calm lagoon waters.

Some island countries only exist due to corals, such as certain archipelagos of atolls or low islands (e.g. the Maldives, Kiribati). There are 420 atolls in the world, most of them in the Pacific and most inhabited by people whose resources are limited to coconuts and coral reef fishes. Reefs provide construction materials and protein for communities with a subsistence economy. Reefs and lagoons are the location of pearl oyster culturing (such as for the black pearls of French Polynesia).

World coral reef degradation

Due to human demographic pressures, which are increasing on coral reefs, and due to the absence of integrated coastal management, coral reefs are being degraded. Construction of harbours, marinas and airports is reducing the extent of fringing reefs near urban areas, which is not without consequences for the equilibrium of the whole coral reef ecosystem – mainly because fringing reefs are areas where fish juveniles grow before they spread out over the whole reef as adults. In addition, dredging causes extensive destruction where it occurs, with degradation all around. Heavy terrigenous sedimentation, coming from rivers and due to bad land management, is suffocating corals and reefs. Nutrients from agriculture and sewage give an advantage to algae on corals. Overfishing, sometimes using destructive methods, is also damaging reefs and threatening their survival.

About 10% of coral reefs have been destroyed without any possibility of recovery, and 50% of those remaining are in danger. On a world scale, the most seriously threatened reefs are in the South-East Asian and Caribbean countries, not forgetting that a massive bleaching event in 1998 caused catastrophic mortality among coral. This affected all regions of the world, but mainly that of the Indian Ocean. Research pro-

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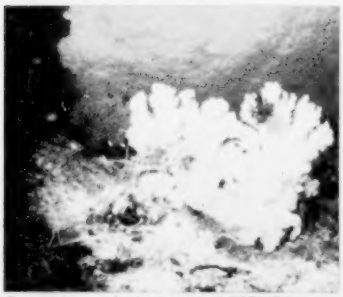
Eco-tourism: mangrove walks ©GBRMPA



Gorgonian and whip corals ©GBRMPA

Pontoon moored at Kelso Reef near Townsville ©GBRMPA

grammes have been launched to address some of the social and economic consequences.

Tourism and coral reefs

Tourism activities in the coastal tropics are based on sun, sea and sand. Coral reefs and white sand beaches are therefore emblematic of tourism. Tourism is the largest industry in the world, with more than 600 million visitors a year, increasing to over a billion by 2010. Destinations in coral reef countries are among the most rapidly expanding markets. About 300,000 diving trips are proposed to about 6 million divers, but diving is not the only activity. Among others are staying on beaches, cruises, yachting, fishing and sports (e.g. surfing, jet skiing). The types of degradation of reefs due to tourism activities can be divided into five large categories: waste, including sewage; recreational, such as anchor damage to corals; construction, such as wharves and piers; misuse, such as coral harvesting; and bad management, such as overcrowding of fringing reefs.

Among tourism activities, some experiences have been or are successful. One could mention the Great Barrier Reef off the east coast of Australia, with its long-term management plan, or the Maldives, with selective activities organized on different islands and in the context of Muslim culture. Bonaire is an example of a self-sufficient coral reef park deriving income from visitors. Dominica has an eco-tourism approach at the governmental level.

Choice of development and carrying capacity

One cannot develop all the different types of human activities on coral reefs, as many of these are not compatible with nature preservation. This is especially true in the case of small tropical islands with lagoons and reefs. The smaller the island, the smaller the number of economic activities that can be supported. It is not possible, on a small island surrounded by a coral reef belt, to have both intensive agriculture and important tourism activities. There would be a risk of conflicts of interest and pollution problems. Moreover, the carrying capacity of the reefs themselves faced with tourism activities needs to be taken into account. One reef, like one island, can support several hundred tourists per year but not hundreds of thousands. Decisions must be made between mass tourism, eco-tourism or high-level tourism. All these decisions are likely to be made by the local and/or governmental authority in accordance with its development policy.

Such choices are determined above all by the natural environment. Australia, with its approximately 350,000 km² Great Barrier Reef, had the possibility to organize areas with different uses such as fishing, recreation and navigation. Tourism in the Great Barrier Reef Marine Park is jointly managed by the Great Barrier Reef Marine Park Authority and the Queensland Department of Environment and Heritage. The Maldives decided to devote some islands to tourism, and some of these islands cater to tourists with a special interest in diving.

Political will at governmental level

Political will is needed in order to produce a sustainable development plan for tourism activities. Coordination among different ministries (Tourism, Environment, Development) is essential to avoid conflicts. This has been realized using different structures (commissions or delegations), with participation of the private sector and all stakeholders. In Australia again, consultation with the tourism industry is being established through the Association of Marine Park Tourism Operators. In Egypt, where there were three times more divers on reefs in 1996 (600,000) than in 1994 and serious degradation, a special committee was set up (National Committee on Reefs Recreative Activities).

Snorkelling on Lamont Reef

Community involvement

The tourism industry in the tropics is recent, and it occurs in different cultural contexts. Tourism will not develop in the future without any connection with local communities. More and more local communities are reluctant to accept hotels which function in a closed economy while taking advantage of the natural environment which is the heritage of villagers, even if there is no conflict of interest in terms of the space and resources of the coral reefs.

Nature belongs to local communities, not to tourists. There is increasing pressure from local authorities (government and/or villagers) to be involved not only in resorts presently functioning, but also in the planning of future tourism projects. This situation is sometimes emphasized by the political opposition against the local government, often through associations for the protection of the environment. Tourism operators should pay increasing attention to communities' participation in all projects.

Long-term strategic planning

Long-term strategic planning is one way to ensure sustainable tourist development related to

coral reefs. A long-term plan is necessary in order for each recreational activity to develop within the spatial and time limits which have been decided. Such a long-term plan recognizes some objectives to be reached in the future: a healthy environment, optimum fishing, carrying capacity in terms of tourists, eco-labelling, etc. A 25-year strategic plan for the Great Barrier Reef has been elaborated, related to its inscription on the World Heritage List in 1994.

Eco-labelling

The tourism industry, as well as governments and local communities, should do more than protect the environment (on which both the industry and inhabitants' economies depend). Together with regulations, voluntary approaches are a recent way of ensuring long-term commitments and improvements. An example is eco-labelling, a tool for certification of environmental performance which promotes high environmental standards and gives tourists the possibility to choose sustainable recreational activities. A number of eco-labels have been established in three main focus areas: facilities-accommodation, services-tour operators, and recreational interests such as beaches and nature parks. These eco-labels are not specific to any one type of ecosystem. Some are well known, such as the Blue Flag in Europe.

Integrated coastal reef area management

Coral reefs exist between land and sea. They have to be protected from degradation in their own space, and from that coming from the land or the sea. The greatest danger is from the land, where human activities develop. Many reefs have been destroyed because of bad land management, such as deforestation for agriculture or urbanization, when sedimentation has killed the reefs. Watersheds have to be considered in regard to all human activities. Integration of tourism infrastructure and activities in a management plan for coastal reef areas considers only one aspect of human activities in the area.

As for the reef area itself, the best solution is to define zoning for activities (e.g. snorkelling, diving, jet skiing, navigation, fishing) or allow no activities at all (e.g. strict reserves). Marine protected areas (parks and reserves) are interesting ecologically, but also for tourism development. Regulations preserve the reefs, but parks are also one way to sensitize and educate interested tourists.

Sensitization and education

More and more tourists are concerned with preserving the natural environment. They appreciate all efforts and ask for information on the subject, being happy to have green tourism.

In fact, the best success for the tourism industry, in coral reef areas as in others, is to ensure that tourists are happy with their trip. This will be based not only on transportation, service and accommodations, but increasingly in the future also on how successfully the natural and cultural environment was integrated where they spent some days or weeks. What better success than for a tourist to say when back home: "The hotel was fine, the coral reefs were beautiful and well preserved, and we now understand how important these reefs are for the local community"? ◆

The International Coral Reef Initiative (ICRI)

The International Coral Reef Initiative (ICRI) was founded by eight governments on the initiative of the United States. The other countries are Australia, France, Japan, Jamaica, the Philippines, Sweden and the United Kingdom. ICRI is a partnership among countries and organizations seeking to implement Chapter 17 of Agenda 21 (and other international conventions and agreements) for the benefit of coral reefs and related ecosystems. Since its creation in 1995, when both a call for action and a framework for action were adopted, ICRI has come to encompass the participation and support of additional governments, UN organizations (in particular, UNEP and its Regional Seas Programmes Units), sources of multilateral development funds (especially the World Bank), environmental and developmental NGOs (such as IUCN and WWF), scientific associations, the private sector (including the tourism industry) and foundations.

Regional workshops were organized between 1996 and 1998 to define national and regional needs and priorities and catalyze the development of national coral reef initiatives, which now exist in various forms (e.g. in Australia, France, Mexico and the US). A call for action and a framework for action, elaborated in 1995, have been adopted by more than 80 countries out of the over 100 that have coral reefs. Major activities concern management, capacity building, research and monitoring, and review of the implementation of ICRI objectives. Important roles are played by UNEP and the International Oceanographic Commission (IOC) of UNESCO. A Global Coral Reef Monitoring Network (GCRMN) has been launched to monitor reefs and determine their status regularly. Monitoring is carried out at different levels of complexity, ranging from that undertaken by villagers to the work of scientific teams, and involves several networks such as Reef Check.

The Coordinating and Planning Committee (CPC) is the ICRI's executive body. Its secretariat, which had moved from the US State Department to Australia, is currently in France until the next International Conference on Coral Reefs in Indonesia in October 2000. The most recent CPC meeting, held in Paris on 15-16 March, had 35 participants. A new call for action, adopted at the end of 1998, emphasizes the importance of public awareness, participation by all stakeholders (including involvement of communities), more integrated coastal zone management for more sustainable development of coral reef areas and resources, and the well-being of all affected communities.

The French Initiative on Coral Reefs (IFRECOR)

On 17 March 1999, the French Government launched the French Initiative on Coral Reefs (IFRECOR), a national activity to encourage the protection and sustainable management of coral reefs in French overseas departments and territories (the "DOM-TOM"). The national IFRECOR Committee is made up of elected representatives and delegates from the DOM-TOM, government administrative bodies, scientific and technical experts, and representatives of concerned NGOs and socio-professional groups. The committee will be placed under the co-presidency of the Ministry of Spatial Planning and the Environment and the State Secretariat for Overseas Affairs. It will be supported by local committees consisting of local stakeholders in each department and territory that has coral reefs.

The principal aims of the Committee are ensuring that both policy-makers and the public are aware of the cultural, social, ecological, economic and political importance of coral reefs; ensuring that coral reefs are protected and sustainably managed (with local community participation) as part of an integrated DOM-TOM coastal management system; and establishing a forum in which the DOM-TOM can share experience with coral reefs and contribute to the information dissemination.

The following actions have been identified:

- elaboration of a national strategy and action plan for protection and sustainable management of coral reefs in the DOM-TOM;
- mobilization of financial support;
- support for implementation of the action plan based on two complementary approaches – by type of problem affecting all coral reefs (erosion, water pollution, fishing, etc.) and by integration of all problems at specific pilot sites;
- implementation of information and educational strategies;
- creation and/or federation of coral reef monitoring networks in the DOM-TOM as sub-nodes of the global network;
- strengthening French cooperation in regional activities.

For more information about IFRECOR and the ICRI, contact: ICRI Secretariat; Fax: +33-1-42-19-17-72; E-mail: genevieve.verbrugge@environnement.gouv.fr; http://www.environnement.gouv.fr/ecr

Tourism and Recreation: the Great Barrier Reef Marine Park

Tourism is the main commercial use of the Marine Park. Every year it contributes around $650 million dollars to the Australian economy. In 1997, tourism brought over 1.5 million visitors to the area.

The majority (around 85%) of marine tourism use of the Marine Park is centred in the offshore Cairns and Whitsunday areas, representing only 5% of the Park. In Cairns the marine tourism industry attracts large numbers of international tourists, with day visits to pontoon and mooring sites and extended diving and fishing charters. Whitsunday marine operations focus largely on visits to island bays and resorts, with Australia's largest bareboat fleet operating in the area.

The volume and profile of tourism use of the Great Barrier Reef Marine Park has changed significantly in the past 20 years, presenting new challenges to managers. As marine tourism has expanded and diversified, the Great Barrier Reef Marine Park Authority has adopted a more strategic and integrated management approach which considers both the individual and cumulative impacts of tourism and recreation use.

Ensuring that the ecological impacts of tourism and recreation activities are effectively managed remains a priority for the Authority. It is important that the policies developed provide for both the conservation of natural and cultural values and an appropriate balance of use opportunities. In particular, priority is being given to building strong working relationships with the Marine Park tourism industry.

Tourism use is jointly managed by the Great Barrier Reef Marine Park Authority and the Queensland Department of Environment and Heritage, within the statutory framework of zoning plans, management plans and permits. The Authority's new approach to managing marine tourism will be based on:

- strategic policy and planning;
- direct management;
- self-regulation by the industry; and
- active partnerships.

Strategic policy and planning

The Authority is developing a Reef-wide plan for managing tourism use throughout the whole of the Marine Park. This will provide a strategic framework for future management which takes into account the cumulative impacts of tourism use. The planning process will identify natural, social, cultural and heritage values which could be affected by tourism and recreation, and will also identify methods to protect values.

The strategies will be implemented through changes in legislation and policy, statutory Plans of Management, and education and training. The first Plans of Management, for the Cairns and Whitsunday areas, were gazetted on 22 June 1998, incorporating provisions for protection of the values of both areas and for managing use of the Reef, particularly tourism and recreation activities. These plans introduce management strategies such as settings, limits to use for some sites, recognition of historic use of sites by tourism operators, and a booking system for access by these operators to some sites or areas. Similar strategies may be applied through other plans currently being developed for the Cardwell/Hinchinbrook and Capricorn/Bunker areas.

Direct management

The Authority, in consultation with the Queensland Department of Environment and Heritage, is revising its approach to managing the current permit system. Presently based on detailed assessment and ascribed conditions at the individual tourism operation level, the system will be changed to more standardized individual permits based on statutory requirements concerning activities within the Park.

The standardization of the permit system will be introduced in parallel with the implementation of the Cairns and Whitsunday Plans of Management, and will be extended as planning is completed in other areas. Individually crafted permits will be replaced with a range of standard permits based on class assessment. Large and complex tourism proposals and developments will still require individual assessment.

Self-regulation by industry

The Authority has been working with the marine tourism industry to encourage and facilitate greater self-regulation, through the adoption of codes of conduct and compliance with best environmental practices. A number of industry associations have been effective in regulating their activities through their own codes.

Many operators who recognize the importance of interpretative activities employ staff with appropriate skills to inform passengers about the Reef and best practices. The tourism industry training programmes developed by the Authority for Marine Park tour operators in 1996 continue to be implemented and reviewed. Operators are encouraged to facilitate staff training through this programme.

The Authority is investigating, with the marine tourism industry and other stakeholders, systems of accreditation for Marine Park guides and operators. Authority staff are working closely with the Whitsunday bareboat industry to pilot a staff training programme which will form the basis of future accreditation for this industry.

Active partnerships

Stakeholder participation will continue to be an important component of marine tourism management, through involvement in development and review of management plans and policy. Formal processes for consultation with the tourism industry are being established through the Association of Marine Park Tourism Operators (AMPTO). Mechanisms for community consultation have already been established through coastal Regional Marine Resource Advisory committees, with representation from all stakeholder groups. In addition, new expertise-based Reef Advisory Committees are to be established by the Authority to advise on issues specific to the four new Critical Issues Groups, including the Tourism and Recreation Group. The Great Barrier Reef Consultative Committee will continue to fill a strategic advisory role to the Minister and the Authority.

Tourism industry members continue to assist managers and researchers with site monitoring and visitor surveys in order to gain a better understanding of the cumulative impacts of tourism. The Cairns marine tourism industry is involved in the development and implementation of site monitoring systems through the "Eye of the Reef" programme.

Summary

Tourism management in the Great Barrier Reef World Heritage Area has come under considerable scrutiny in the past ten years, as expansion and diversification in marine tourism has challenged existing strategies. The Great Barrier Reef Marine Park Authority, working closely with its partners in management, the Queensland Department of Environment and Heritage and the marine tourism industry, is adopting a more strategic and integrated management approach. The focus of future management will move away from individual operations to place-based management, with emphasis on preventing and managing cumulative impacts. Integral to the success of this approach will be continued consultation with stakeholder groups during the period of change.

All photographs in Tourism Focus N° 11 courtesy of the Great Barrier Reef Marine Park Authority.

For more information, contact Annie Hett, Director, Tourism and Recreation, Great Barrier Reef Marine Park Authority, P.O. Box 1379 Townsville 4810, Australia, Tel.: +61 (0)7 4750 0700, Fax: +61 (0)7 4772 6093, http://www.gbrmpa.gov.au ◆

UNEP's contribution to ICRI

UNEP contributes to the mission and goals of the International Coral Reef Initiative (ICRI) by creating awareness of the need to protect sensitive environments such as coral reefs, and of the conditions and principles of sustainable tourism. It disseminates examples of best practices and voluntary initiatives such as eco-labelling, codes of conduct and environmental management systems.

At the request of the ICRI Coordinating and Planning Committee (CPC), UNEP will prepare a report on tourism and coral reef protection. This report will serve as the basis for discussions on tourism during the next CPC Meeting in Guadeloupe in October 1999.

World News

Climate change conference adopts action plan

The fourth Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) was held in Buenos Aires, Argentina, in November. The two-week meeting, in which representatives of 170 governments participated, concluded with the adoption of a two-year Plan of Action to reduce the risk of global climate change. This action plan includes deadlines for the finalizing of unresolved details of the Kyoto Protocol, which is due to take effect sometime after 2000. It also promotes transfer of environmentally sound technologies to developing countries and responds to the needs of countries affected by global warming and by the economic burden of climate change response measures.

The Kyoto Protocol commits developed countries to legally binding targets for reduction of GHG emissions. Their agreement to an over 5% emissions reduction below 1990 levels by early next century is intended to reverse the upward trend. The protocol will establish international "emissions trading", allowing developed countries to buy and sell emissions credits but only among themselves, so that they will not be able to meet their emissions reduction requirements by trading credits with developing countries without actually reducing their own emissions. Developing and transition countries will be aided by the Clean Development Mechanism (CDM) and joint implementation programme, which will provide credits for financing emissions-avoiding projects.

UNEP's Executive Director Klaus Töpfer called for effective cooperation and collaboration among all stakeholders, to "repair the environment and forestall a climate catastrophe." He stressed that the "mechanisms" agreed to in Kyoto at the last meeting of the Conference of the Parties cannot replace domestic action by industrialized countries. "The bottom line is that developed countries must start cutting their emissions of greenhouse gases. They should adopt win-win strategies, those that reduce emissions in ways that also help the economy. All other action should be supplemental to this effort." Töpfer noted that the Kyoto Protocol mechanisms, especially the CDM and technology transfer, can lead to progress on climate change problems but do not constitute a solution by themselves.

At the conference EU environment ministers called for measures to reduce, not merely stop the increase of, greenhouse gas emissions, as well as an as yet undefined ceiling on the use of flexible mechanisms such as emissions trading. Other countries, including Kazakhstan and the host country, Argentina, expressed their intention to commit to emissions limitation or reduction targets. The United States signed the Kyoto Protocol during the conference.

The Protocol will become legally binding when at least 55 countries have both signed and ratified it. A further requirement is that these must include countries accounting for at least 55% of all 1990 CO_2 emissions from developed countries. Sixty countries had signed the Protocol by the time the Conference of Parties ended. Two countries – Fiji, and Antigua and Barbuda – had ratified it.

Participants in the conference included over 1500 government officials, 2600 observers from intergovernmental and non-governmental organizations, and 880 members of the press. Some 150 NGOs representing business and environmental interests also participated.

As an indication of growing business involvement with climate change issues, a group of insurance industry representatives presented a report on that industry's concerns. Climate change may be contributing to a series of natural disasters, such as hurricanes and El Niño, that have cost insurers billions of dollars in claims payouts in the past several years. Climate change represents not only potential costs to the industry, but potential opportunities for new or adapted products and services. The report assesses the Kyoto Protocol, noting that its implementation mechanisms need to be better defined in order to attract private sector involvement. It calls for the creation of reporting standards that will allow insurers to assess industrial performance in regard to emissions and climate change issues.

Emissions trading has also drawn the attention of the private sector. Australian stockbrokers plan to start an emissions-trading market in 1999, in hopes of making it the centre of emissions credits trading for the Oceania region. In the United States the Emissions Marketing Association (EMA), a consortium of brokers, energy-related companies and government agencies, urged support for a market-based approach to emissions credit trading. EMA is opposed to plans by the UN Conference on Trade and Development (UNCTAD) to create a members-only emissions trading market. EMA envisions an open trading market modelled on the US's domestic NO_x and SO_2 emissions credit market. It fears the scheme proposed by UNCTAD will actually discourage development of emissions trading.

The Kyoto Protocol development process continues with the next Conference of the Parties, to be held in late 1999 in Bonn, Germany.

Official documents from the Conference and other information, as well as the texts of the Convention and Protocol, are available at http://www.unfccc.de.

For further information, contact: Michael Williams, UNEP Information Unit for Conventions, Geneva. Tel.: +41 (22) 917 8242/44, Fax: +41 (22) 797 3464, E-mail: mwilliams@unep.ch ◆

Study finds 40% of deaths caused by pollution and environmental factors

A Cornell University study released in September 1998 found that 40% of deaths world-wide are caused by "pollution and other environmental factors". Cornell ecology professor David Pimentel and his graduate student researchers, who studied population trends, climate change, pollution levels and emerging diseases, concluded that man-made pollution and environmental changes are responsible for increasing numbers of deaths. They further concluded that higher temperatures caused by global climate change will contribute to additional deaths due to extreme weather events and tropical diseases.

The researchers found that at present rates of increase of deforestation and soil degradation, millions of people would be forced from their homes by the need to find food, fuel and building materials. Populations increasingly crowded into villages and cities would be at particular risk from new outbreaks of old diseases such as the plague, and would contribute to the spread of diseases such as schistosomiasis, a deadly water-borne parasite that infests fresh water supplies. Infants and young children are more susceptible to illnesses caused by lack of sanitary conditions in developing countries, especially lack of safe drinking water.

Air pollution was also identified as a major health hazard potentially affecting most of the world's population. The researchers pointed out that the number of automobiles is growing three times faster than the world population, contributing to air pollution. Smoke from indoor cooking fires that burn wood or dung kills some 4 million children each year.

For more information, contact: Dr David Pimentel, Cornell University, Ithaca, NY 14853-2801, USA. E-mail: dp18@cornell.edu. ◆

Computer database in Honduras aids disaster relief and rebuilding

A digital atlas of Honduras is assisting efforts to rebuild following Hurricane Mitch. The atlas is a computer database containing information on population, soil types, crop distribution, climate and topography for the entire country, as well as features such as roads, bridges, hospitals, wells and water pumps. It was created by the Centre for Tropical Agriculture (CIAT) in Cali, Colombia, to improve watershed management. Completed just days before Mitch struck in October 1998, the database was updated after the hurricane with satellite information on the depth and extent of flood waters. It also shows where floods and landslides did the greatest damage, destroying crops and isolating villages. The database information allows local officials and relief workers to plan seed production and distribution so as to maximize their effectiveness and return crop produc-

tion to normal as quickly as possible. The effort is particularly important in Honduras, where 62% of workers are employed in farming and most nutrition comes from locally grown maize and beans.

Mitch is only one of a series of hurricanes, tropical storms and other natural disasters (such as El Niño) in recent years. Climate change may be contributing to the increase in the number and severity of such events. In addition to efforts to control climate change, disaster planning and response are becoming increasingly important.

UNEP has made improved and coordinated response to natural disasters a priority. It is currently undertaking a project aimed at reducing the impact of such disasters through early warning and preparedness, focusing on El Niño (e.g. see "World News" in the last issue of *Industry and Environment*).

For more information, contact: Centre for Tropical Agriculture, Apartado Aéreo 6713, Recta Cali-Palmira, Km 17, Cali, Colombia. Tel.: +57-2-445-0000 (direct) or +1-650-833-6625 (via USA). Fax: +57-2-445-0073 (direct) or +1-650-833-6626 (via USA). E-mail: ciat@cgnet.com, Cali, Colombia; or contact Robert Bisset, UNEP Media and Communications Officer. Tel.: +254-2-623084. Fax: +254-2-623692. E-mail: robert.bisset@unep.org. ◆

Industry Updates

US Corporations take voluntary action to cut Emissions

Several major American corporations, including General Motors, Monsanto and the American operations of British Petroleum, have agreed to take voluntary action to reduce CO_2 emissions. CO_2 is considered a "greenhouse gas" that may contribute to global warming. These companies joined with the World Resources Institute (WRI) to form the Climate Protection Initiative, which seeks to define "safe climate, sound business" scenarios. It stresses market-oriented strategies to reduce carbon emissions, but some of the companies involved remain opposed to any new government-mandated emissions controls. The companies did not endorse the Kyoto Protocol, which calls for developed countries to reduce their CO_2 emissions by over 50%, compared with 1990 levels, early in the next century.

The initiative represents a change of direction for General Motors, which has long downplayed the possibility of climate change. Some other companies, however, have already acknowledged climate change concerns. British Petroleum had previously announced that it would reduce CO_2 emissions by 10%, and its initiative was promptly matched by Shell Oil. Other major companies have recently called for (usually voluntary) action to reduce CO_2 emissions over the next several years. Some, such as United Technologies, a maker of aircraft engines and air conditioners, will focus on reducing energy use as a way of responding to climate change concerns – as well as saving money.

The new group's first action has been to assess future world energy demand, new technologies and business opportunities, and the effectiveness of different ways to gain business and consumer involvement (see *Safe Climate Sound Business: An Action Agenda*, WRI, 1998). The group encourages businesses to:

- measure, track, and openly report greenhouse gas emissions from their operations;
- seize near-term opportunities to reduce and sequester greenhouse gas emissions from worldwide facilities, products, and supply chains;
- develop new cost-effective technologies, products, and business ventures for minimizing emissions and achieving sequestration in the 21st century;
- include global climate considerations in new investment decisions in both developed and developing nations;
- educate employees, customers, suppliers and other key stakeholders to raise their awareness of climate change issues, their own contribution, and potential response options;
- participate in the debate on climate change at both the national and international level and contribute constructively to policy formulation and implementation.

Saying that there is no inherent conflict between economic development and a healthy environment, the group stated: "We believe that finding common ground and understanding differences among business, government, and environmental interests is critical to ensure both a safe climate and a sound business outcome."

For more information, contact: World Resources Institute, 10 G Street, N.E., 7th Floor, Washington, D.C. 20002, USA. Tel.: +1 (202) 729-7600, Fax: +1 (202) 729-7610, Internet: www.wri.org/wri. ◆

Large companies improve environmental performance of their suppliers in Mexico

A World Bank-sponsored programme in Guadalajara, Mexico, has found that large companies can improve the environmental performance of their small suppliers. The programme's findings show that corporations can make a significant difference to environmental performance in developing countries, according to the consultants who managed it.

The two-year programme was a collaboration between the World Bank and eleven large industrial companies, including the multinationals Honda, Lucent Technologies and IBM, as well as Mexican companies Cementos Mexicanos and Casa Cuervo. Its aim was to apply the ISO 14001 model to environmental management systems (EMS) of small and medium enterprises, and to evaluate whether the ISO 14001 EMS system is appropriate for smaller businesses. Each large company chose one to three of its smaller suppliers to participate in the programme, which provided training and assisted the businesses to develop and implement their own EMS. The large companies and the World Bank provided funding, and the services were delivered by The Lexington Group, US consultants, and by local consultants from nearby universities.

Initial results show that small and medium enterprises can, with adequate technical support, use the EMS model and that they can use it to achieve significant improvement of their environmental performance. Over 80% of the participating SMEs reduced their environmental releases, almost 70% improved their work environment, and over half improved their economic performance while achieving environmental improvements. The World Bank notes that these gains have been made even before the EMS is fully implemented, and that more can be expected once companies have established a systematic process to manage environmental issues. Many of the benefits came from improved housekeeping practices. According to the World Bank, "this serves to illustrate the point that the gains from good housekeeping are potentially very large in the case of SMEs, and that an EMS provides a means to capture these gains very quickly."

For more information, contact: World Bank, 1818 H Street, N.W., Washington, D.C. 20433 USA. Tel.: (202) 477-1234, Fax: +1 (202) 522-2632, E-mail: info@worldbank.org, Internet: www.worldbank.org/nipr/work_paper/guadal/. Or contact: The Lexington Group, 110 Hartwell Avenue, Lexington, MA 02421, USA. Tel.: +1 (781) 674-7306, Fax: +1 (781) 674-2851, E-mail: rwells@lexgrp.com, Internet: www.lexgrp.com. ◆

European Commission publishes proposals to revise EMAS

The European Commission has published its proposals for revision of the EU's voluntary eco-management and audit scheme (EMAS). The revisions are intended to encourage business participation in EMAS and to raise the scheme's profile and credibility. A key change is a proposal to open EMAS to all organizations, not just industrial sites.

The Commission hopes the extension of EMAS will allow it to address a much broader range of environmental impacts, both direct and indirect.

EMAS originated in 1993 as a voluntary programme, using peer pressure and supply-chain management rather than command-and-control methods to encourage corporate responsibility, and allowing businesses to "address environmental issues within the framework of their economic considerations." Although participation is voluntary, companies must adhere to all of the scheme's requirements once they have agreed to seek EMAS registration. These requirements include compliance with all applicable environmental regulations. Implementation is certified by an accredited independent verifier.

The scheme's goals are not only to improve environmental performance and foster regulatory compliance, but also to communicate environmental performance information to the public. The revisions are aimed at increasing participation, especially among the small and medium enterprizes that make up the great majority of European companies. About 2000 industrial sites have achieved EMAS registration so far, but most of these are in Germany and participation in other countries has been low.

The revision proposals incorporate the ISO 14000 programme as a way of meeting the EMAS environmental management system requirement. This aims to eliminate any duplication of work created by implementation of both systems, while retaining the EMAS requirements that take the scheme farther than ISO 14000. These requirements include a commitment to continual improvement in environmental performance, compliance with environmental legislation, and publication of a statement on environmental impact and performance. A new requirement would also mandate employee involvement in EMAS implementation. To increase EMAS's credibility with the public, the required environmental statement will have to be updated and revalidated every year instead of every three years, as currently required.

In keeping with its emphasis on supply-chain management, EMAS also goes further than ISO 14000 in its purchasing-related requirements. Participants must show that they have identified and address...l any significant environmental impacts of their procurement procedures. As part of its guidance for EMAS participants, the revision proposal includes a list of direct and indirect environmental effects that participants should consider in assessing their procurement-related impacts.

Noting that it can exert significant influence through its investment policies, the Commission singled out the financial services industry as an example of a commercial sector where EMAS can be profitably introduced. Successful EMAS pilot projects in the banking and insurance industries have demonstrated the scheme's potential for positive influence on investment policies.

The Commission wants to introduce a logo to increase the EMAS programme's visibility and recognition. The logo could be used on a letterhead, validated environmental statements and participants' informational publications, but not on advertising, products or packaging.

While the ISO 14000 and logo proposals are uncontroversial, a suggestion to reduce regulatory controls on EMAS participants has drawn stronger reactions. UNICE, the European employers federation, has indicated its support for regulatory benefits for EMAS-participating organizations based on the rationale that EMAS' regulatory compliance requirement and its incentives to exceed regulatory standards reduce the need for government supervision. This practice is already in effect in some countries, notably the Netherlands. Many environmental groups, however, oppose the idea.

For more information, contact: Klaus Krisor, European Commission, Brussels, Belgium. Tel.: +32 (2) 299 0385, Fax: +32 (2) 299 0313. ◆

UNEP Focus

UNEP and international business associations discuss environmental strategies

Representatives of 50 major international and national industry associations met with senior United Nations officials in Paris in October. The meeting was organized by UNEP to review industry progress in implementing environmental management tools, and to discuss emerging production and consumption issues. The 15th annual consultative meeting provided an opportunity to exchange both information and practical experience.

Industry sectors represented included petroleum, travel and tourism, construction, food, finance and insurance, and chemicals. National industry associations from all regions of the world participated. Association representatives presented their main environmental management activities, the critical issues they are facing, and trends in the development of environmental strategies and polices. Participants discussed the latest developments in environmental performance reporting and indicators, including a proposed CO_2 indicator, and ISO 14000. UNEP TIE Division Director Jacqueline Aloisi de Larderel presented UNEP TIE's priorities and outlined recent changes in the UNEP organization.

Participating associations include: Alliance for Responsible Atmospheric Policy, USA; American Institute for Pollution Prevention, USA; American Petroleum Institute, USA; Asociacion Nacional de Industriales (ANDI), Colombia; Chamber of Commerce and Industry of the Russian Federation; Confederation of Finnish Industries and Employers; The European Cement Association (CEMBUREAU), Belgium; E&P Forum (the Oil Industry International Exploration & Production Forum), UK; European Wind Energy Association, UK; International Federation of Consulting Engineers (FIDIC), Switzerland; European Construction Industry Federation (FIEC), Belgium; Federation of Swedish Industries; Global Environmental Management Initiative, USA; Global Crop Protection Federation, Belgium; Indian Agro Paper Mills Association, India; International Chamber of Commerce, France; International Coffee Organization (ICO), UK; International Council of Tanners, UK; Industrial Environmental Forum of Southern Africa, South Africa; International Fertilizer Industry Association (IFA), France; International Hotels Environment Initiative (IHEI), UK; International Hotels and Restaurants Association (IH&RA), France; International Institute of Refrigeration (IIR), France; International Petroleum Environmental Conservation Association (IPECA), UK; International Research Group on Wood Preservation (IRG), Sweden; London Insurance and Reinsurance Market Association, UK; Orec, France; Pacific Asia Travel Association (PATA), Monaco; Prince of Wales Business Leaders Forum (PWBLF), UK; World Business Council for Sustainable Development (WBCSD), Switzerland; World Coal Institute, UK; The World LPG Association (WLPGA), France; World Travel and Tourism Council (WTTC), UK.

For more information, contact: Nancy Bennet or Françoise Ruffe, UNEP TIE, Tour Mirabeau, 39-43 quai André Citroën, 75739 Paris Cedex 15, France. Tel.: +33 (1) 44 37 14 50, Fax: +33 (1) 44 37 14 74, E-mail: unepie@unep.fr. ◆

UNEP's new Division of Regional Cooperation and Representation

A new UNEP office, the Division of Regional Cooperation and Representation, has been set up in Nairobi to respond to the need for better coordination between UNEP's headquarters and regional offices. Its director reports directly to the Deputy Executive Director of UNEP and, through him, to the Executive Director. The new office promotes regional policy integration, coordinates programme planning, and provides services to UNEP's six regional offices world-wide. Among its main goals are:

- ensuring that regional perspectives and priorities are adequately reflected in UNEP's global programmes;
- helping to shape major regional environmental policy fora to better reflect UNEP's environmental policy priorities;

- providing regions with access to headquarter's knowledge base, and giving headquarters access to the regional knowledge base for advice and information regarding major regional issues; and
- ensuring that the regional offices are managed, oriented and equipped to meet the priorities expressed in the work programme.

UNEP's Executive Director has also appointed two new Regional Directors: Ricardo Sanchez Sosa, Cuba's former Vice-Minister for Science, Technology and Environment, will direct UNEP's Regional Office for Latin America and the Caribbean (ROLAC). He has already been involved in the development of UNEP's programmes as Head of the Cuban delegation to the Governing Council and the High Level Committee of Ministers and Senior Officials of UNEP, as well as through his involvement in the Forum of Ministers of the Environment of Latin America and the Caribbean. Following a teaching position at the University of Havana as a professor of hydrology, water resources and the environment, Mr Sanchez began working for the Government of Cuba in 1985. He has served as President of the Media Relations Agency of the Ministry for Science and Technology, and became Vice-Minister in 1996. The ROLAC office is headquartered in Mexico City.

Mahmood Yousef Abdulraheem Ali has been appointed to direct the Regional Office for West Asia (ROWA). Mr Ali, former Deputy Director of the Regional Organization for the Protection of the Marine Environment in Kuwait, began his career at Kuwait's Ministry of Health. He has also served as Deputy Director of Kuwait's Environment Protection Department. Mr Ali has participated in several UNEP activities, including Governing Council sessions, the preparatory meetings for the Vienna Convention on the ozone layer, the Basel Convention preparatory meetings, and the Climate Change Convention preparatory meetings for the Conference of the Parties. He joines the ROWA office in Manama, Bahrain.

For more information, contact: Tore Brevik, Director, UNEP Information and Public Affairs, Nairobi. Tel.: +254 (2) 623292, Fax: +254 (2) 623692, E-mail: Tore.Brevik@unep.org ◆

Donors commit funds to close Russia's CFC factories

Ten donor countries have committed US$ 19 million to help the Russian Federation close its chlorofluorocarbon (CFC) and halon production facilities by 2000. The manufacture and use of these substances contribute to depletion of the earth's ozone layer and have already been banned in most industrialized countries.

UNEP has been working to protect the ozone layer through two legal agreements: the Vienna Convention for the Protection of the Ozone Layer, and the Montreal Protocol on Substances that Deplete the Ozone Layer. These agreements aim to phase out production and consumption of ozone-depleting substances such as CFCs throughout the world. Russia was to have eliminated its production and consumption of these substances by the end of 1996, but its political and economic transition caused delays. It is therefore seeking the help of the international community in completing the phase-out.

Russian manufacturers are responsible for approximately 9% of total world production of CFCs. Their manufacturing capacity is significantly greater than current production, however, as it represents almost half of the world capacity. The funds, which will be used to compensate producers for ceasing production, were raised as part of a special World Bank initiative and will supplement the US$ 10 million commitment already made by the Global Environmental Facility (GEF) to help Russia meet it: Montreal Protocol obligations.

The GEF, which is administered by UNEP, the World Bank and UNDP, has contributed US$ 60 million overall to changing Russian consumer industry technologies to ozone friendly substitutes. Closing the production sector is essential in order to stop the sale and smuggling of CFCs to industrialized countries where their manufacture has already stopped.

"The closure of the production facilities should result in complete compliance with the Montreal Protocol, not only in the Russian Federation but also in many other countries which get supplies from Russia," said UNEP Executive Director Klaus Töpfer. "On behalf of UNEP and the world community, I thank the donors – Austria, Denmark, Finland, Germany, Italy, Japan, Norway, Sweden, the UK and the USA – for their special contribution to this important project.

Russia also committed itself to phase out production and consumption of carbon tetrachloride and methyl chloroform by 2000 and to observe the controls on hydrochlorofluorocarbons, which also contribute to ozone depletion, and of methyl bromide, a highly toxic chemical.

For more information, contact: Robert Bisset, UNEP Media and Communications Officer UNEP Nairobi, Tel.: +254 (2) 623084, Fax: +254 (2) 623292, E-mail: Robert.Bisset@unep.org, or the Ozone Secretariat, UNEP Nairobi, Tel.: +254 (2) 623885, Fax: +254 (2) 623913, E-mail: sarmam@unep.org, Internet: www.unep.org/unep/secretar/ozone; or UNEP IE OzonAction Programme, Paris, Tel.: +33 (1) 44371450, Fax: +33 (1) 44371474, E-mail: ozonaction@unep.fr, Internet: www.unep.ie/ozl/ozonaction.html.

Books & Reports

GENERAL

Silent Revolution

The Dutch government and the Confederation of Netherlands Industry and Employers jointly produced *Silent Revolution*, which discusses the development and results of Dutch environmental policy over the past ten years. The authors describe the collaborative process by which national policy was formed in meetings between industry and government representatives. The two sides, often adversaries in past dealings, negotiated to create a system based on the philosophy that primary responsibility for environmental protection should rest with industry.

Under the Dutch programme, companies or industry groups commit themselves to meeting environmental targets and deadlines. The government, in return, allows them considerable latitude in choosing their strategies and methods. The authors claim that this policy has achieved considerable success in meeting environmental goals, although they acknowledge and discuss its shortcomings. They conclude with a discussion of the policy's weak points and potential ways to improve its results.

(1998). Ministry of Housing, Spatial Planning and the Environment (VROM), Distribution Centre, P.O. Box 351, 2700 AJ Zoetermeer, The Netherlands. Tel.: +31 79 34 49 449, Fax: +31 79 34 49 448, Pbk., 111p.

Third International Conference of the UNEP Insurance Initiative: Environmental Tools for the Insurance and Financial Industries

The UNEP Insurance Industry Initiative was launched in 1995 to explore ways to incorporate environmental and sustainability concerns into decision-making in the insurance industry. Climate change is of particular concern in the industry, as it has the potential to contribute to natural disasters. The third UNEP Insurance Industry Initiative conference was held in June 1998 in Cologne, Germany. This volume includes proceedings from and papers presented at the conference. Conference participants included insurance industry representatives, environmental organizations, academics, government officials, and members of other financial services sectors. Sessions were included on climate change considerations, environmental reporting, data formats and requirements, and investment performance.

(1998). Secretariat of the UNEP Insurance Industry Initiative, 15, chemin des Anémones, CH-1219 Châtelaine, Geneva, Switzerland. Tel.: +41 (22) 917 1978, Fax: +41 (22) 796 9240, E-mail: eteu@unep.ch. Pbk.

International Environmental Consulting Practice

There is increasing demand for environmental consulting services in the developing world, due in part to requirements of international aid and financial organizations relating to the development projects they fund. At the same time, saturation of the environmental field is occurring in some developed countries, especially the United States. This book discusses opportunities for environmental consultants in developing countries and provides guidance on setting up an international consulting practice. It covers the background and history of environmental consulting, the practical aspects of setting up a consulting business, and prospects for consulting work in a variety of environmental fields and countries. The author is a staff member of the US EPA and chairman of the African Environmental Research Consulting Group.

Peter A. Sam (1998). John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, USA. Tel.: +1 (212) 850-6011, Fax: +1 (212) 850-6008, E-mail: info@wiley.com, Internet: www.wiley.com. Hbk., 300p. ISBN 0-471-17984-1.

EcoDesign Empirically Explored

This PhD thesis examines the development of "cleaner" products by Dutch small and medium enterprises, and the factors that make some products more successful than others. The author studied internal and external influences, such as customer demand, government regulation and personal commitment by employees, as well as barriers to cleaner product development. The full text is included in both English and Dutch.

Carolien G. Van Hemel (1998). Delft University of Technology, Delft, The Netherlands. Dist. Boekhandel MilieuBoek, Plantage Middenlaan, 2H, 1018 DD Amsterdam, The Netherlands. Tel.: +31 20 624 4989. Pbk., 30p. ISBN 90-9011667-2.

ENERGY

The Clean Development Mechanism and Africa

This report from a regional workshop in Accra, Ghana, in September 1998 presents a summary of discussions on the Clean Development Mechanism (CDM) of the Kyoto Protocol as it relates to Africa. While Africa is a relatively minor contributor of global greenhouse gas emissions, it is one of the parts of the world most vulnerable to the potential effects of climate change. Its low current emissions provide an opportunity for more sustainable development than has been the case in other, more developed countries. The conference report discusses the CDM's potential as a tool in regard to sustainable development projects in energy, transport, forestry and agriculture, as well as financial considerations.

(1998). UNEP Collaborating Centre on Energy and Environment, Risø National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel.: +45 46 32 22 88, Fax: +45 46 32 19 99. Pbk., 16p. ISBN 87-550-2448-3.

CLIMATE CHANGE

Climate Change Mitigation in Africa

These are the proceedings of a conference held in Victoria Falls, Zimbabwe, in May 1998, sponsored by UNEP and the Southern Centre for Energy and Environment. The conference included discussion of the Kyoto Protocol and its implications for Africa, regional cooperation, and the relationship between development and climate change mitigation. Participants presented papers on climate change mitigation studies in several individual African countries, as well as regional analysis and strategies.

Gordon A. Mackenzie, John K. Turkson and Ogunlade R. Davidson, eds. (1998). UNEP Collaborating Centre on Energy and Environment, Risø National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel.: +45 46 32 22 88, Fax: +45 46 32 19 99. Pbk., 156p. ISBN 87-550-2427-0.

Climate Change Mitigation in Asia and Financing Mechanisms

This conference was held in Goa, India, in May 1998. It was sponsored by UNEP and the Southern Centre for Energy and Environment. The report of the conference includes papers on climate change mitigation studies in several individual Asian countries. The conference included discussion of the Kyoto Protocol as it relates to Asia, and a significant World Bank contribution concerning its Prototype Carbon Fund.

P.R. Shukla and Pramod Deo, eds. (1998). UNEP Collaborating Centre on Energy and Environment, Risø National Laboratory (see above). Pbk., 341p. ISBN 87-550-2468-8.

CHEMICALS, POLLUTION AND ACCIDENTS

Environmental Soil and Water Chemistry

Environmental Soil and Water Chemistry gives an overview of soil science as it relates to soil and water pollution, using the interactions between soil and water as a basis for understanding the nature, extent and treatment of soil and water pollution. It includes discussions of the basic chemistry needed to understand soil and water quality and treatment, with chapters covering pollution from organic compounds, nitrates, phosphates, salts and suspended solids. The author discusses the processes and activities through which pollution occurs, as well as pollution control and treatment applications. This textbook is aimed at undergraduate and graduate students of soil science, environmental science, agricultural or environmental engineering, and environmental geology.

V.P. Evangelou (1998). John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012, USA. Tel.: +1 (212) 850-6011, Fax: +1 (212) 850-6008, E-mail: info@wiley.com, Internet: www.wiley.com. Hbk., 564p. ISBN 0-471-16515-8.

WATER

Sourcebook of Alternative Technologies for Freshwater Augmentation in Africa

Many countries face increasing demand for fresh water due to growing populations and continuing development of industry and agriculture. There are many ways to improve water supplies, but lack of communication and information transfer among water managers in different countries has hampered their use. This sourcebook, prepared in collaboration with several international and regional agencies and sponsored by UNEP's International Environmental Technology Centre (IETC), is intended to provide water resource managers and planners with information on a wide range of technologies used throughout the world. It is particularly aimed at managers and planners in developing countries or economies in transition.

In addition to technical descriptions, there is a discussion of suitability and other considerations in regard to methods for improving domestic agricultural and industrial supplies. Specific conditions in Africa and the methods best suited to local needs are considered. This publication is part of the IETC Technical Publication Series on freshwater augmentation.

(1998). UNEP IETC, 2-110 Ryokuchi Koen, Tsurumi-ku, Osaka 538-0036, Japan. Tel.: +81-6-6915-4581, fax: +81-6-6915-0304.

Sourcebook of Alternative Technologies for Freshwater Augmentation in Some Asian Countries

This publication is part of the IETC Technical Publication Series on freshwater augmentation (see above). It includes consideration of specific regional conditions and the methods best suited to local needs. Case studies are presented for projects in India and Nepal, and field surveys include information from Bangladesh, India, Nepal and Thailand.

(1998). UNEP IETC (see above).

Sourcebook of Alternative Technologies for Freshwater Augmentation in Latin America and the Caribbean

This publication is part of the IETC Technical Publication Series on freshwater augmentation (see above). It includes consideration of specific regional conditions in Latin America and the Caribbean and the methods best suited to local needs.

Web Site Highlight

China-Canada Cooperation Project in Cleaner Production
www.chinacp.com

The China-Canada Cooperation Project in Cleaner Production is an English and Chinese language site designed for people who are interested in the implementation of cleaner production in China. The Chinese language portion of the site is designed for factories and other organizations in China that are implementing cleaner production. Created by the China-Canada Cooperation Project in Cleaner Production and funded by the Canadian International Development Agency, the site focuses on the project, but also provides information on the more general issues of Cleaner Production and ISO 14000, other cleaner production activities in China, and links to relevant cleaner production, pollution prevention and ISO 14000 web sites in Canada and internationally.

For more information, contact: Kenneth Parent, Project Director, PricewaterhouseCoopers, 99 Bank Street, Suite 800, Ottawa, Ontario, Canada K1P 1E4, Tel.: +1 (613) 237-3702, Fax: +1 (613) 237-3963, E-mail: kenneth.r. parent@ca.pwcglobal.com, or Dr Robert C. Lao, Resident Project Coordinator, 5 Dongzhimen Beidu, Suite 1501, Chaoyang District, Beijing, P.R. China 100004, Tel.: +86 10 6508-7465, Fax: +86 10 6501-1369, E-mail: ccpu@public.bta.net.cn.

UNEP/GRID-Arendal
www.grida.no

UNEP/GRID-Arendal is an internationally recognized information centre providing decision-makers and the public with improved access to high quality environmental information. It supports UNEP in expanding the use of such information for awareness-raising, policy-making and action. GRID-Arendal presents a comprehensive set of graphics depicting the greenhouse gas emissions in the Annex I countries and commitments according to the Kyoto agreement. There are also several graphics and maps presenting consequences of climate change. These graphics are available free on their web site; to see them, go directly to *http://www.grida.no/db/maps/collection/climatechange/index.htm.*

For more information, contact: Aake Bjoerke, Information Manager, GRID-Arendal, P.O. Box 1602, Myrene N-4801 Arendal, Norway, Tel.: +47 37035650, Fax: +47 37035050, E-mail: bjoerke@grida.no.

Sustainable Business Webspace
www.mindspring.com/~bhamner/sbw-home.htm

The Sustainable Business Webspace is an online subject and links guide to sustainable business, cleaner production, and environmental management. Organized by subject, it can be read like a book by novice users, or used as a links guide by those who know what they are seeking. There are major sections on Life Cycle Scoping, Sustainable Value Chains, TQEM, Waste Management, and Business Sectors. The site includes links to downloadable software and databases related to sustainable development and environmental engineering.

For more information, contact: Burton Hamner, Hamner and Associates, 4343 4th Avenue NW, Seattle, WA 98107, USA, Tel./Fax: +1 (206) 789-5499, E-mail: bhamner@mindspring.com.

(1998). UNEP IETC (see above).

WASTE MANAGEMENT

Proceedings of the International Experts Meeting on Sustainable Management of Waste Water and Storm Water

This experts meeting, held in May 1998 in Osaka, Japan, was organized to discuss the direction of the UNEP International Environmental Technology Centre's project on "Promoting Sustainable Management of Waste Water and Storm Water". The project, which aims to improve conservation and management of freshwater resources using environmentally sound technologies (ESTs), has developed a source book and training materials for administrators and other decision-makers. This report includes discussion of ESTs, case studies on urban sewage handling problems, and presentations on information systems and technology selection.

(1998). UNEP IETC (see above). Pbk., 120p.

NATIONAL/REGIONAL

Increased Productivity through Environmental Management: A Manual for the Semiconductor and Electronics Industries

This book by a consortium of Philippine business and environmental groups is aimed at managers and owners of semiconductor and electronics manufacturing facilities in the Philippines. It includes specific technical guidance for waste management and minimization, as well as regulatory information and recommendations for integrating environmental responsibility into company activities and concerns.

Philippine Business for the Environment (1998). Ground Floor, DAP Building, San Miguel Avenue, Pasig City, Metro Manila 1601, Philippines, Tel.: +63 (2) 635-3670, Fax: +63 (2) 631-5714, E-mail: pbe@pdi.org.ph, Pbk., 90p.

Environment Hong Kong 1998

This report by Hong Kong's Environmental Protection Department presents information on the state of Hong Kong's environment and its progress during 1997. It is also available in Chinese.

(1998). Hong Kong Environmental Protection Department, 28/F, Southorn Centre, 130 Hennessy Road, Wan Chai, Hong Kong, Tel.: +852 2835 1001, Fax: +852 2835 2155, Pbk., 254p.

From Nigeria

I write to commend your organization for the excellent presentation, detailed organization and professional production of some UNEP IE publications I have recently come in contact with [including] *Industry and Environment*. The above mentioned publications have assisted me in the effective discharge of my duties, particularly the efficient management of chemicals in an environmentally sound manner.

Specifically, they have at various times been used to prepare lecture notes for an in-house training workshop for newly recruited environmental factory inspectors; to develop user charges and a permitting scheme for facilities and recyclables; and as reference materials in developing draft national guidelines to meet local industrial requirements on safety, environmental auditing and hazardous waste management.

Mrs. Olukitan M. Ogunghuyi
Assistant Chief Environmental Scientist
Federal Environmental Protection Agency
PMB 3150, Surulere
Lagos, Nigeria

THE ROLE OF UNEP
INDUSTRY AND ENVIRONMENT

It is now widely accepted that sustainable development and a sound environment go hand-in-hand. UNEP recognized this as early as 1975 when it established the Industry and Environment centre in Paris. UNEP IE functions as a catalyst to bring industry, government and non-governmental organizations together to work towards environmentally sound forms of industrial development. UNEP IE seeks to:

- define and encourage the incorporation of environmental criteria in industrial development;
- help formulate policies and strategies for sustainable industrial development and facilitate their implementation;
- promote preventive environmental protection through cleaner production and other pro-active approaches; and
- stimulate the exchange of information on environmentally sound forms of industrial development.

To achieve these goals, UNEP IE has developed programmes in the fields of Awareness and Preparedness for Emergencies at Local Level (APELL), Cleaner Production, Tourism, Energy, and other sector-specific activities. The OzonAction Programme, under the Multilateral Fund, is also based at UNEP IE. UNEP IE organizes conferences and seminars, undertakes training activities and demonstration projects, and produces practical supporting publications.

To promote the transfer of information and experience, UNEP IE has developed:

- The *Industry and Environment* quarterly review;
- A *Query-Response Service*, which responds to specific technical queries on a wide range of subjects related to industrial pollution;
- *Outreach Activities*, which address a broad range of issues concerning industry as a whole. UNEP IE develops partnerships with industry, government and non-governmental organizations, organizes consultative meetings, and publishes supporting documents aimed at spreading new developments in the field of sustainable development.
- A *Technical Report Series*, policy reports and training materials, which provide practical information to readers throughout the world. For a list of available publications, please contact UNEP IE.
- Information and exchange clearinghouses, which provide the latest news on cleaner production and OzonAction related activities.
- UNEP IE's web site, which encourages and supports the adoption of environmentally sound technologies and environmental management methods.

UNEP
UNITED NATIONS ENVIRONMENT PROGRAMME
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http://www.unepie.org/home.html

FEEDBACK

If you would like to respond to something you've read in these pages – to agree or to take issue with a point of view, to clarify a point of fact, or to provide information on a particular aspect – write to us. If you would like to air your views on any other subject relevant to *Industry and Environment*, we would like to hear from you. As space is limited, we cannot guarantee to publish all letters, nor to publish long ones in full.

Send your Feedback letters to:

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Industry and Environment Review
UNEP IE
Tour Mirabeau
39-43, quai André-Citroën
75739 Paris Cedex 15, France

Fax: +33 (1) 44 37 14 74
E-mail: unepie@unep.fr

Industry and Environment Review

published by the United Nations Environment Programme
Industry and Environment – UNEP IE

For over fifteen years, the ***Industry and Environment*** quarterly review has provided a forum for exchanging information and experience. Articles are contributed by industry managers, government officials, researchers and others who are active in the field of sustainable industrial development. In addition to features, news and developments of broad international interest, each issue of the review focuses on a particular theme. Recent issues have covered such varied topics as climate change and industry, education and training, managing contaminated land, transport, and sustainable tourism development. For a complete list of past issues and their availability, contact UNEP IE.

The next issue of ***Industry and Environment*** will focus on financial services.

While ***Industry and Environment*** is an English language publication, it often includes articles in French and Spanish. All contributed articles are accompanied by summaries in English, French and Spanish.

The Review is also available in Chinese.
For further details, please contact:
Professor Chen Dingmao, Research Center for Eco-Environmental Sciences, Academia Sinica, P.O. Box 2871, Beijing 100085, China.

INDUSTRY AND ENVIRONMENT SUPPLEMENTS

The ***Industry and Environment*** review includes four semi-annual supplements: the *APELL, Cleaner Production* and *EnTA* newsletters, and *Tourism Focus*.

UNEP IE's APELL programme – Awareness and Preparedness for Emergencies at Local Level – seeks to minimize the occurrence and impact of industrial accidents. The newsletter keeps readers up-to-date on APELL programmes currently in progress around the world.

The Cleaner Production newsletter provides information on cleaner technologies and products, actions by governments and organizations to promote cleaner production, and the UNEP IE Cleaner Production activities and network.

The EnTA newsletter reports on technology assessment as a tool to develop environmentally sound technologies and to discourage the export of technologies that pose potential environmental hazards.

Tourism Focus reports on developments in the field of sustainable tourism and on the activities of the UNEP Tourism Programme.

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